



FIAT SCUDO



DOCUMENTATION MODIFICATIONS / UPDATES

Date	Referent	File Name	Description of modification

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This publication is issued for training purposes only.

Exhaustive, updated technical information for servicing purposes can be found in the service manual and any other service information for the vehicle model concerned.



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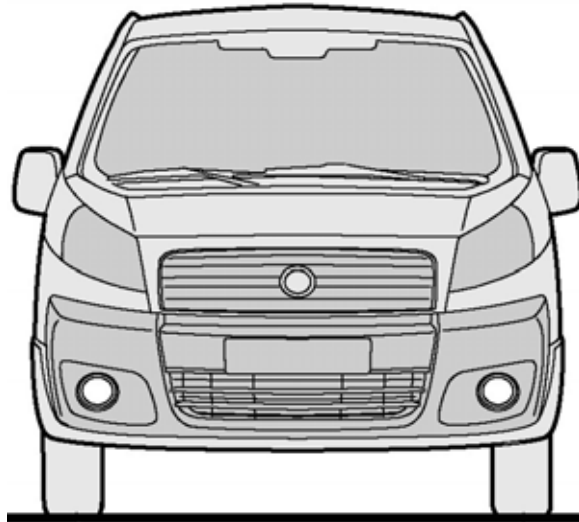
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1. BRIEFING

1.1 I Contents in brief



Commercial Vehicle customer requirements are continually evolving and, to keep on being a market leader, it is necessary to be able to satisfy and anticipate these needs. For this reason, Fiat Scudo is now presented with entirely renewed and punchier styling as well as many features that will continue to make this vehicle a point of reference in its segment for its style, breadth of range, versatility, functionality, performance, driving comfort and quality of life in the vehicle.

The product's evolution can be summarized in four macro-areas of operation:

- style renewal
- greater capacity/ease of loading
- greater power/torque of the engines
- greater comfort
- lower running costs

Especially:

- new range of Multijet diesel engines, in compliance with the Euro4 standard: more powerful, more elastic, more dependable and more cost-effective. The 2.0 136CV top version is equipped with an F.A.P. antipollution system ;
- Two-zone climate control with additional rear climate control;
- Rear air suspensions with variable loading deck height to make loading and unloading goods easier;
- Improved safety:
 - with a latest generation ABS system and the choice of the full version with ESP, ESR, MSR, HBA and Hill Holder;
 - Two Airbag versions with or without "Windows Bag"
- Two ranges of bodywork for the following versions:
 - "Long or short wheelbase" Van with high or low roof;
 - "Long or short wheelbase" Combi with low roof;
- More pleasurable driving with the power steering system featuring an electro-hydraulic fluid pump;
- To improve comfort the vehicle can also be fitted with a Bluetooth hands-free system.



1.2 Engines

The new SCUDO is equipped right from its sales launch with the following engines:

1560 Multijet 90CV (66 KW) Engine – Max Torque 180Nm at 1750 rpm.

1997 Multijet 120 CV (88KW) Engine – Max Torque 300Nm at 2000 rpm.

1997 Multijet 140 CV (103KW) Engine – Max Torque 320Nm at 2000 rpm.

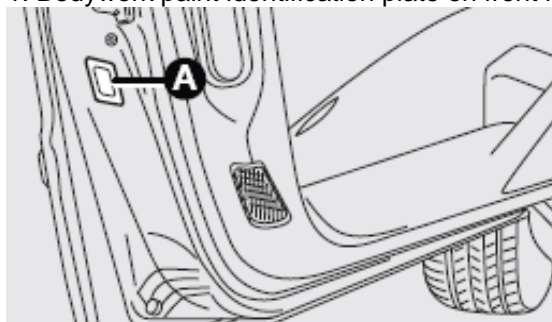
The following table gives the engine-clutch-gearbox combinations for the vehicle at issue:

Engine	F.A.P.	Clutch	Gearbox
1.6 90CV	No	Luk	BE4R (5 gears)
2.0 120CV	No	Luk	ML6C (6 gears)
2.0 140CV	Yes	Luk	ML6C (6 gears)

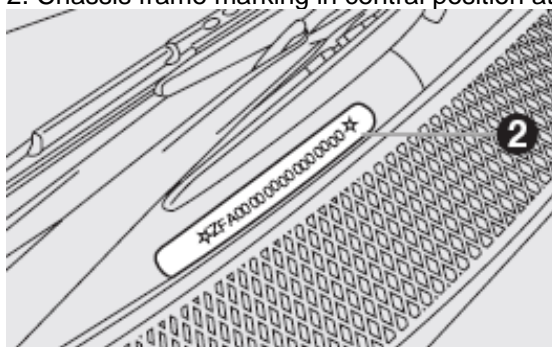
1.3 Vehicle identification data

The vehicle identification data are stamped on specific plates; they are located as follows:

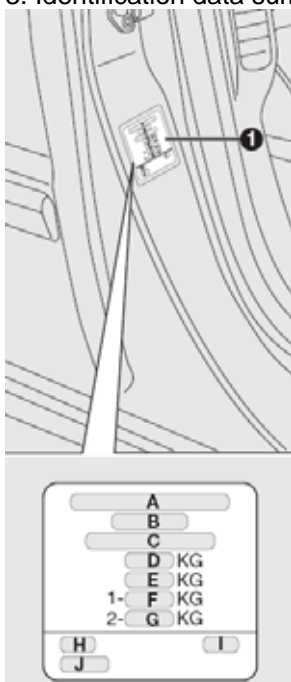
1. Bodywork paint identification plate on front left-hand door



2. Chassis frame marking in central position at the base of the windscreen



3. Identification data summary dataplate on the pillar of the front right-hand door



4. Engine marking on the crankcase



1.4 Bodywork versions

The new Scudo is available with two bodywork versions: Combi or Van, both of which can be ordered with a short or long wheelbase.

Besides these two versions there are others according to the number of seats.

The following table gives the bodywork code numbers according to the version and engine:

- 1.6 90CV Engine

- (270XXAIA AA) Combi short wheelbase – 5/6 seats
- (270XXAIA AB) Combi short wheelbase – 8/9 seats
- (270XXAIA AAL) Combi long wheelbase – 5/6 seats
- (270XXAIA ABL) Combi long wheelbase – 8/9 seats
- (270KXAIA ABL) Combi long wheelbase (greater capacity) – 8/9 seats
- (270ZXAIA ZA) Combi short wheelbase (Cat. NI) – 5/6 seats
- (270ZXAIA ZA) Combi long wheelbase (Cat. NI) – 5/6 seats
- (270ZXAIA ZA) Van short wheelbase 10Q (low roof) – 2/3 seats
- (270ZXAIA WA) Van short wheelbase 12Q (low roof) – 2/3 seats
- (270ZXAIA WAL) Van long wheelbase 12Q (low roof) – 2/3 seats
- (270ZXAIA ZA) Van long wheelbase 12Q (high roof) – 2/3 seats
- (270ZXAIA ZA) Deck long wheelbase 12Q – 2/3 seats

- 2.0 120CV Engine

- (270XXCIB AA) Combi short wheelbase – 5/6 seats
- (270XXCIB AB) Combi short wheelbase – 8/9 seats
- (270XXCIB AAL) Combi long wheelbase – 5/6 seats
- (270XXCIB ABL) Combi long wheelbase – 8/9 seats
- (270KXCIB ABL) Combi long wheelbase (greater capacity) – 8/9 seats
- (270ZXCIB ZC) Combi short wheelbase (Cat. NI) – 5/6 seats
- (270ZXCIB ZCL) Combi long wheelbase (Cat. NI) – 5/6 seats
- (270ZXCIB ZA) Van short wheelbase 10Q (low roof) – 2/3 seats
- (270ZXCIB WA) Van short wheelbase 12Q (low roof) – 2/3 seats
- (270ZXCIB WAL) Van long wheelbase 12Q (low roof) – 2/3 seats
- (270ZXCIB WBL) Van long wheelbase 12Q (high roof) – 2/3 seats
- (270ZXCIB ZAL) Deck long wheelbase 12Q – 2/3 seats

- 2.0 136CV Engine

- (270XXDIB AA) Combi short wheelbase – 5/6 seats
- (270XXDIB AB) Combi short wheelbase – 8/9 seats
- (270XXDIB AAL) Combi long wheelbase – 5/6 seats
- (270XXDIB ABL) Combi long wheelbase – 8/9 seats
- (270KXDIB ABL) Combi long wheelbase (greater capacity) – 8/9 seats
- (270ZXDIB ZC) Combi short wheelbase (Cat. NI) – 5/6 seats
- (270ZXDIB ZCL) Combi short wheelbase (Cat. NI) – 5/6 seats
- (270ZXDIB ZA) Van short wheelbase 10Q (low roof) – 2/3 seats
- (270ZXDIB WA) Van short wheelbase 12Q (low roof) – 2/3 seats
- (270ZXDIB WAL) Van long wheelbase 12Q (low roof) – 2/3 seats
- (270ZXDIB WBL) Van long wheelbase 12Q (high roof) – 2/3 seats
- (270ZXDIB ZAL) Deck long wheelbase 12Q – 2/3 seats



The following figures illustrate the Van version with high and low roofs. Both versions can be ordered with a short or long wheelbase.



The following figure illustrates the Combi version with a low roof, which can be ordered with the short or long wheelbase.



In addition, the Combi version can have the back with two doors or a hatchback:

- Version featuring back with two doors:



- Version featuring back with hatchback:



2. TECHNICAL DATA

2.1 ENGINE

Engine type

	1,6	2.0	2.0
Type code	DV6UTED4		
Position	fitted at 0.4°		
No. of cylinders	4	4	4
Cylinder arrangement			
No. of valves per cylinder	16	16	16
Cycle	Diesel	Diesel	Diesel
Timing system			
Fuel supply	Common Rail Diesel	Common Rail Diesel	Common Rail Diesel

Engine data

	1,6	2.0	2.0
Bore (mm)	75		
Stroke (mm)	88.3		
Total displacement (cm ³)	1560		
Compression ratio			
Maximum power output (kW/CV)	66 / 90		
Maximum power speed (rpm)	4000		
Maximum torque (Nm)	180		
Peak torque speed (rpm)	1750		

Injection

	1,6	2.0	2.0
Type	BOSCH EDC16.34		
Injection order	1-3-4-2	1-3-4-2	1-3-4-2



2.2 GEARBOX

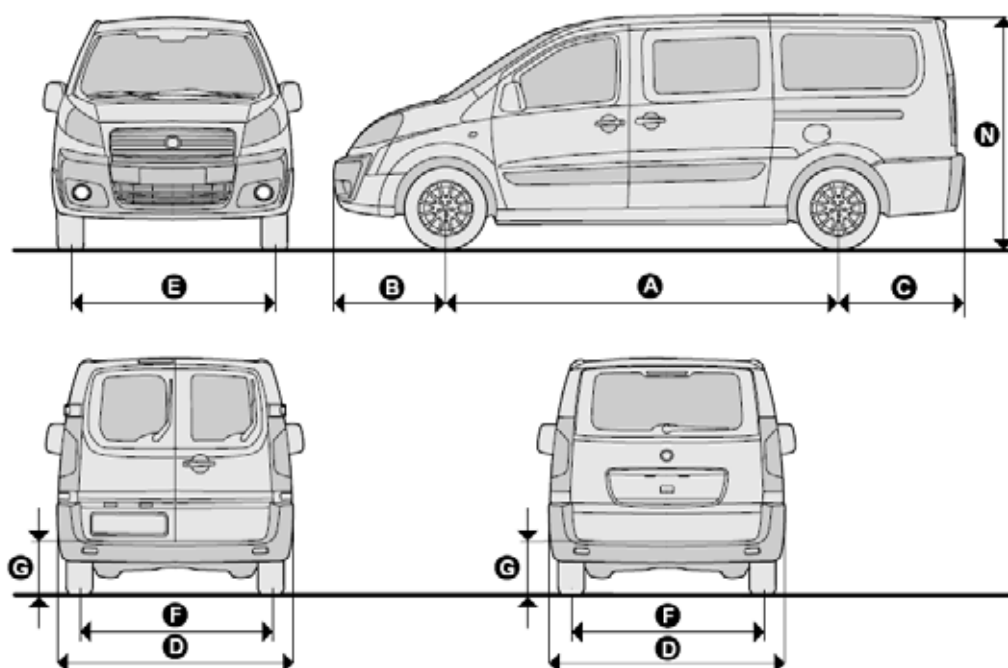
	90 Multijet	120 Multijet - 140 Multijet
Gearbox	Five forward gears plus reverse with synchronisers for coupling the forward gears	Six forward gears plus reverse with synchronisers for coupling the forward gears
Clutch	Self-adjusting with pedal with no loadless travel	Self-adjusting with pedal with no loadless travel
Drive	Front	Front

2.3 BRAKES

	90 Multijet - 120 Multijet - 140 Multijet
Service brakes:	
front	disc (self-ventilating for applicable versions)
rear	disc or drum (on some versions)
Parking brake	governed by hand lever acting on rear brakes



2.4 VEHICLE FEATURES

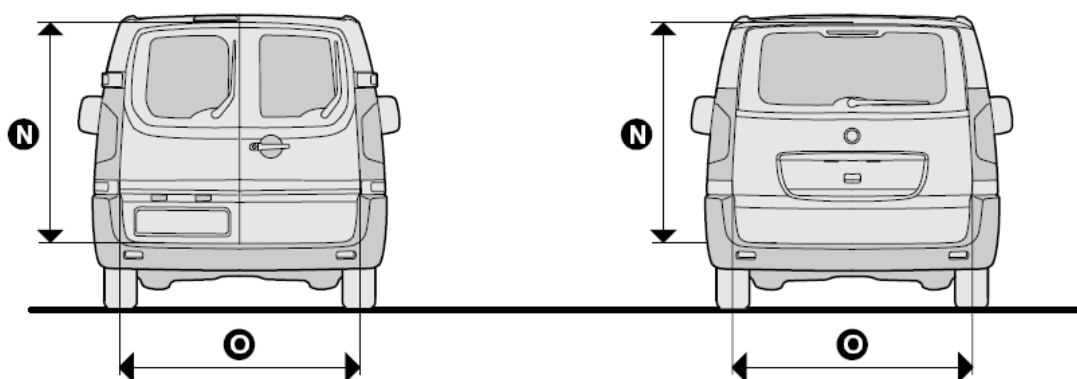


Size

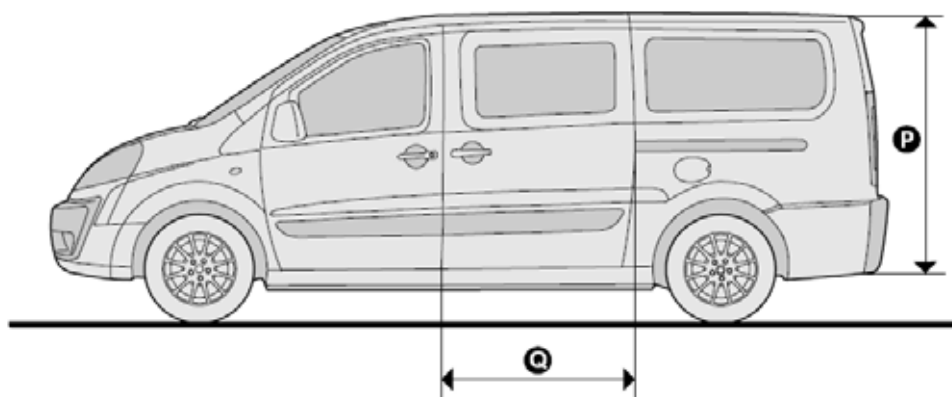
	DIMENSIONS	SHORT WHEELBASE	LONG WHEELBASE
A+B+C	Total length	4805	5153
N	Total height	1894 - 1942 / 2204 - 2276 (*)	1894 - 1942 / 2204 - 2276 (*)
A+B+C	Wheelbase	3000	3122
B	Front overhang	975	975
C	Rear overhang	830	1038
D	Total width:		
	flush with bodywork	1870	1870
	with buffer bands	1895	1895
	with rear-view mirrors collapsed	1968	1968
	with rear-view mirrors open	2194	2194
E	Front track	1574	1574
F	Rear track	1574	1574
G	Height of goods compartment		
	with mechanical suspensions	562 - 604	562 - 604
	with air suspensions	491 - 500	491 - 500

(*) versions with high roof





	DIMENSIONS	REAR DOORS
N	Useful height of two rear doors	1272 - 1630 (*)
O	Useful width two rear doors rear hatch (where applicable)	1237 1237
	(*) versions with high roof	



	DIMENSIONS	SLIDING SIDE DOOR
P	Height	1293 - 1301
Q	Width	924



2.5 SCHEDULED MAINTENANCE

Servicing must be done every 30,000 km

Thousands of kilometres	30	60	90	120	150	180
Check conditions/wear of tyres and if necessary adjust pressure	x	x	x	x	x	x
Check lighting system operation (headlamps, direction indicators, hazard, goods compartment, instrument panel warning lights, etc.)	x	x	x	x	x	x
Check operation of wiper/washer system and adjust nozzles if necessary	x	x	x	x	x	x
Check position/wear of wipers	x	x	x	x	x	x
Check conditions/wear of brake pads and operation of front and rear disc wear indicator (where applicable)	x	x	x	x	x	x
Check conditions/wear of rear drum brake linings (where applicable)		x		x		x
Inspect conditions and integrity: outside bodywork and underbody protection, pipes exhaust-fuel-brakes) rubber parts (caps-sleeves-bushings-etc.) brake and fuel system hoses	x	x	x	x	x	x
Inspect conditions/tensioning of belts driving accessories (except for engines with automatic tensioners)		x			x	
Check and if necessary adjust hand brake travel	x	x	x	x	x	x
Check exhaust gas emissions/smokiness	x	x	x	x	x	x
Check cleanliness of locks and lever mechanism lubrication	x	x	x	x	x	x
Change engine oil and oil filter	x	x	x	x	x	x
Drain diesel filter	x		x		x	
Change diesel filter		x		x		x
Change air filter cartridge	x	x	x	x	x	x
Check and if necessary restore fluid levels (engine cooling-brakes-power steering-windscreen washer-etc.)	x	x	x	x	x	x
Check tension of driving belt(s) for accessories	x	x	x	x	x	x
Inspect conditions of belt(s) driving accessories	x	x	x	x	x	x
Inspect conditions of timing system toothed belt				x		
Renew timing system toothed belt (*)						
Check functionality of engine check systems (with diagnosis socket)	x	x	x	x	x	x
Change brake fluid (or every 24 months)		x		x		x
Change pollen filter (or every 24 months)	x	x	x	x	x	x
Restore specific fluid for particulate filter (version: 140 Multijet)				x		
Change particulate filter (140 Multijet)						x

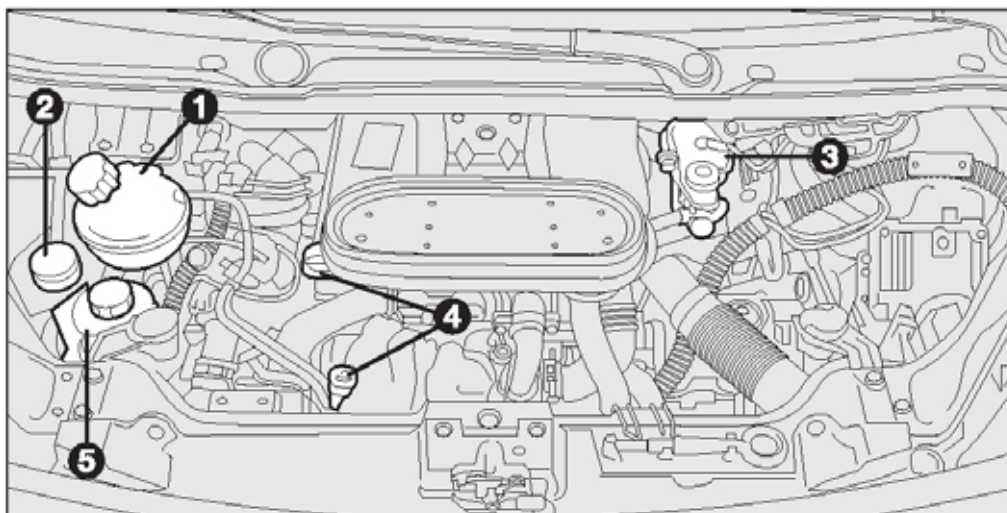
(*) It is recommended to renew the timing belt every 180,000km/10years



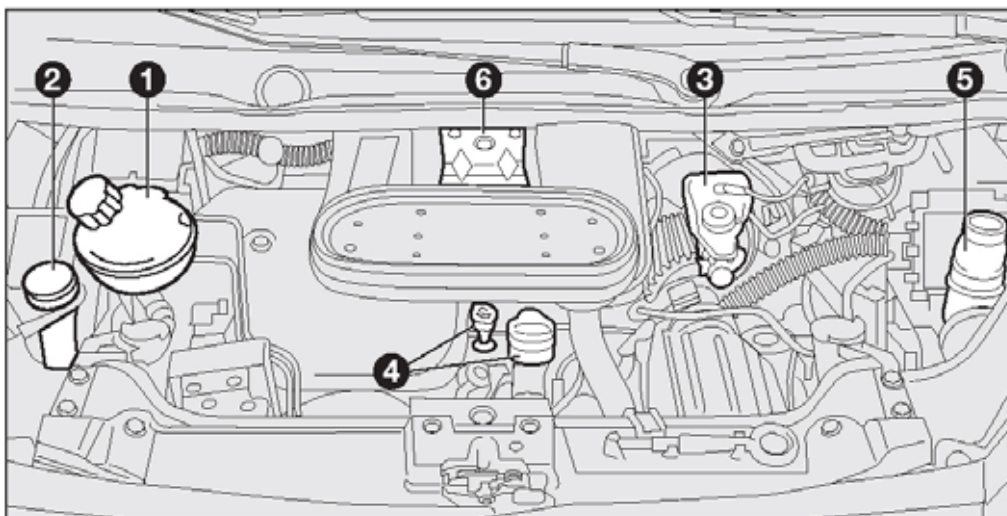
2.6 LIQUIDS

The following figures illustrate the location of the tanks for checking levels.

Version with 1.6 90CV engine



Version with 2.0 120CV and 136CV engine



Key:

- 1. Engine coolant
- 2. Windscreen / rear window / headlamp washer fluid
- 3. Brake fluid
- 4. Engine oil
- 5. Power steering fluid
- 6. Seat for engine oil top-up funnel



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Characteristics of Fluids and Lubricants

Use	Qualitative characteristics of the fluids and lubricants for the vehicle to function correctly	genuine fluids and lubricants	Change frequency
Lubricants for diesel engines	Lubricants with synthetic base of grade SAE 5W-40 qualification FIAT 9.55535-N2	SELENIA WR	According to Scheduled Maintenance Plan
Lubricants and greases for the transmission	Synthetic oil SAE 75w-85 exceeding the specification API G4 and MIL-L-2105 D LEV	TUTELA MATRYX	Mechanical gearboxes and differentials
	Lithium soap based greases with molybdenum bisulphide, consistence NGLI 2	TUTELA MRM 2	Homokinetic joints
Brake fluid	Synthetic fluid F.M.V.S.S. no. 116 DOT 4, ISO 4925, SAE J-1704, CUNA NC 956-01	TUTELA TOP 4	Hydraulic brakes and hydraulic controls clutch
Radiator protection	Protective agent with antifreeze action (red in colour) for monoethylene glycol based cooling systems inhibited with organic formula based on the technology of O.A.T.. It exceeds the specifications of CUNA NC 956-16 astm d 3306	PARAFU UP	Cooling circuits Percentage used: 50% down to -35°C
Liquid for windscreen/rear window/headlamp washer	Mixture of spirits, water and surfactants CUNA NC 956-11	TUTELA PROFESSIONAL SC 35	To be used pure or diluted in the wiper/washer systems

Capacity of Fluids and Lubricants

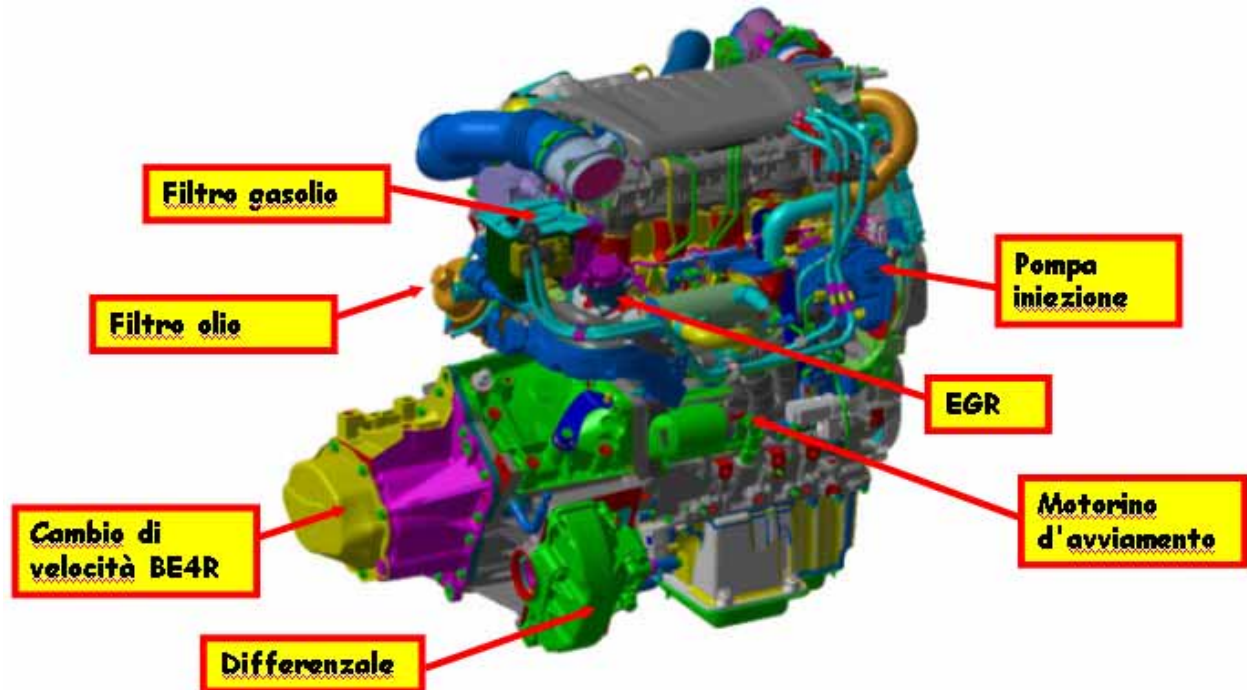
	90 Multijet	120 Multijet	140 Multijet	Specified fuels and genuine lubricants
Fuel tank: litres	80	80	80	Diesel for motor vehicles (Specification EN 590)
Including a reserve of: litres	8	8	8	
Engine cooling system: litres	-	9	9	Mixture of water and fluid PARAFU UP at 50%
Engine sump and filter: litres	6,2	5,25	5,25	SELENIA WR
Gearbox/differential casing kg	-	1,9	1,9	TUTELA CAR MATRYX
Hydraulic brakes circuit with ABS devices (with ESP) kg	0,519	0,519	0,519	TUTELA TOP 4 (*)
Tank for windscreen, rear window, headlamp washer fluid litres	7,5	7,5	7,5	Mixture of water and fluid TUTELA PROFESSIONAL SC 35

(*) The brake fluid must be changed at least every 2 years (van version)



3. MOTORE

3.1 MOTORE 1.6 MULTIJET 90CV (DV6UTED4)



The 1.6 MULTIJET 90CV 4-cylinder engine made entirely of aluminium is a first for Fiat. The main aim in developing this engine was to achieve such a level of dependability as to ensure mileage of 240,000 km or 15 years without any mechanical breakdown (values of dependability that do not concern warranty). These aims have been achieved also thanks to a highly rigid production process, called “**red card**”. In practice, each phase of assembly is carefully checked and if any trouble is found a red card is attached to the engine to avoid other parts pointlessly getting fitted on that engine which is already assigned for rejection.

- Maximum power output of 66 kW (90CV) at 4000 rpm
- Maximum torque of 180 Nm (18.3 kgm) at 1750 rpm
- Reduced maintenance (every 30,000 km, timing belt 240,000km, hydraulic tappets)
- Weight 120 kg
- Exhaust emissions EURO 4



Sixteen-valve engine with hydraulic tappets; the aluminium head is composed of two blocks: an upper block housing the two camshafts joined together by a chain; and a lower block housing the valves.

The monobloc is made of aluminium alloy with cast-iron cylinder liners inserted.

The pistons are designed with an internal oilway, with the oil being sprayed by special nozzles to better dispose of the heat.

The cast-iron connecting rods are fracture split.

The steel crankshaft has heat treated main journals and crank to withstand mechanical stress better.

The cast-iron main bearing caps are sunk in an aluminium casting (crankcase base).

The crankcase base is secured to the crankcase and gearbox with special screws, thereby forming a rigid structure that limits crankshaft bending, reducing main journal noise and wear of the main bearings and big end bearings.

The oil sump is made of aluminium in order to dispose of the heat better. It is closed at the bottom with a plate cover which has the oil drain plug screwed in.

The motion of the timing system is transmitted from the crankshaft to the intake camshaft by a toothed belt and from the intake camshaft to the exhaust camshaft by a chain.

The oil pump is a gear pump coaxial to the crankshaft.

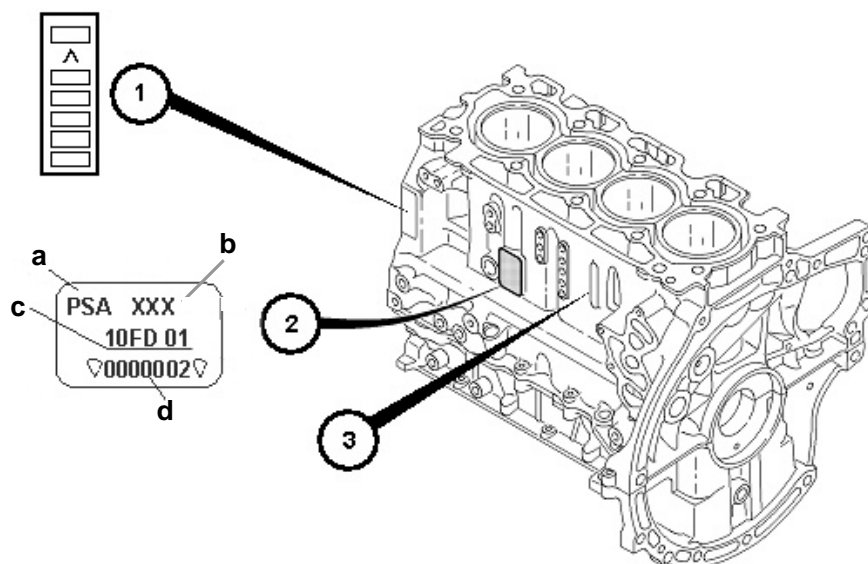
The flywheel is a single piece and the clutch, with torsion springs, uses a pressure plate with a Belleville thrust washer with no plate wear recovery system.

This engine features:

- a Bosch EDC16C34 multijet injection system with a CP1H BOSCH injection pump with three pumping elements and a built-in transfer pump.
- a turbocharging system with air/air exchanger, fixed geometry turbine with wastegate and over-boost system governed by the engine control unit.
- Exhaust gas recycling system composed of:
 1. an EGR valve to let the exhaust circuit communicate with the intake circuit
 2. a throttle valve in the intake circuit to create sufficient vacuum to increase the quantity of EGR.
- an exhaust system with catalyst



Engine markings



❶ Class of main bearing housings

(stamped on timing system side)

❷ Engine identification

a : manufacturer's reference

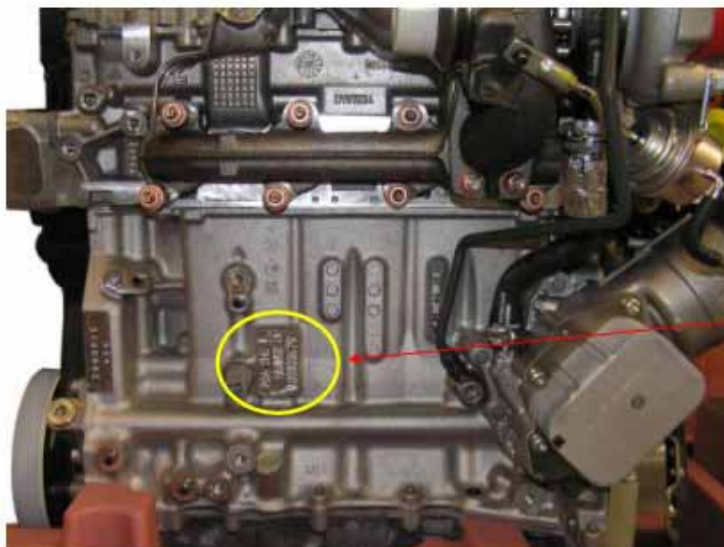
b : regulation type

c : member reference

d : manufacture order number

❸ Industrial machining marking Year of manufacture





Marchatura Motore

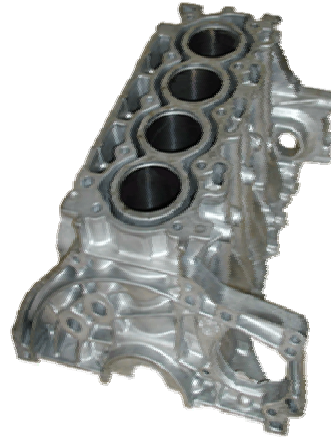
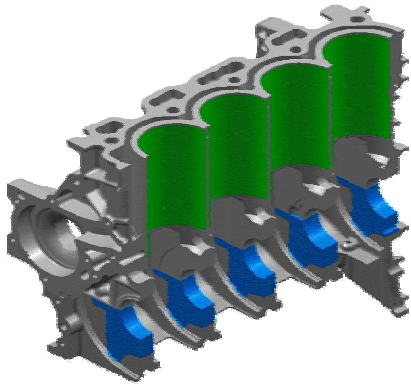
Technical specifications of 1.6 Multijet Engine

Type of engine	DV6UTED4
Power output kW	66 KW
power output Cv/DIN	90 cv
Torque	180 Nm
Displacement	1560 cm ³
Bore / Stroke	75 / 88,3
Turbo	Fixed geometry
Injection type	BOSCH EDC16.34
antipollution	Euro4
Particulate filter	none
All aluminium engine	120 kg
Gearbox	BE4
Fitting (angle)	Engine fitted at 0.4°
Injection system	Bosch Common Rail (1600 bar)



exploded view of engine

Monobloc



The monobloc is made of die-cast aluminium alloy. Suitable coolant and oil galleries are provided in the walls.

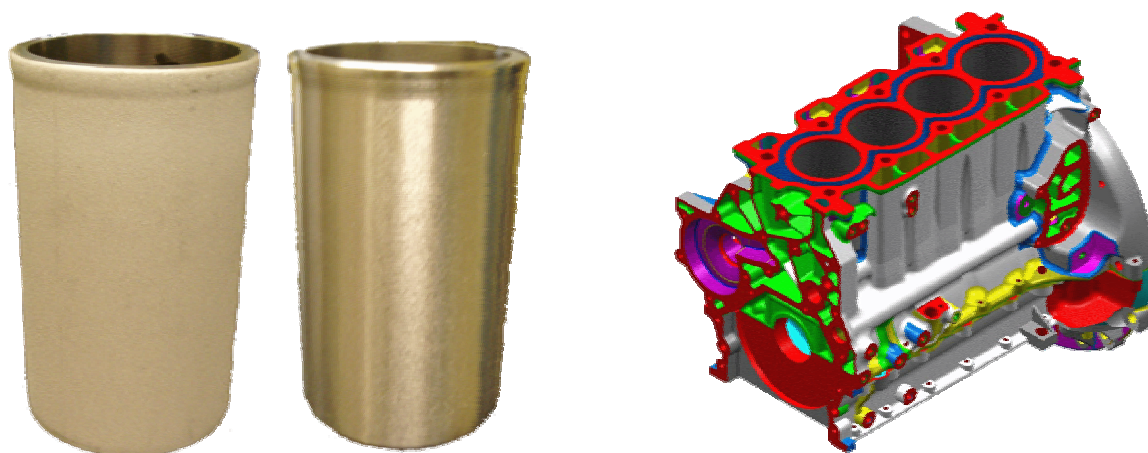
The cylinder liners are made of cast iron and inserted dry (in direct contact with the metal of the monobloc).

To improve the coupling between the cylinder liners and the aluminium monobloc, they are coated with a layer of aluminium.

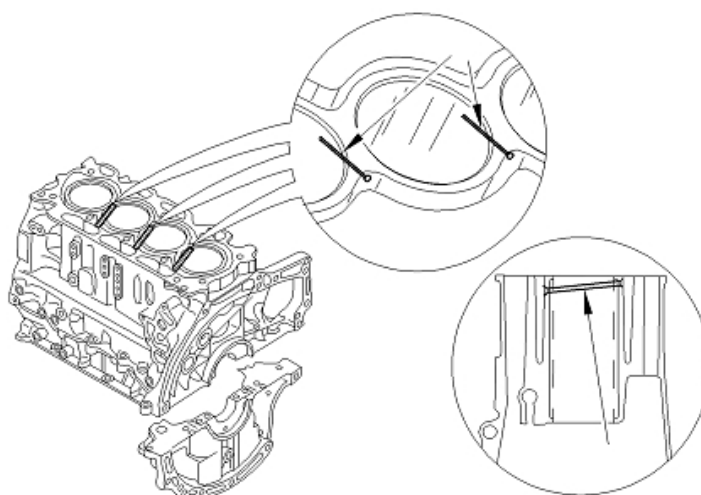
This enables: reducing the risk of cracking (due to different coefficients of expansion) in the zone between the cylinders and improving liner heat disposal.

The following figures show the difference between a cylinder liner coated with aluminium and one not coated.





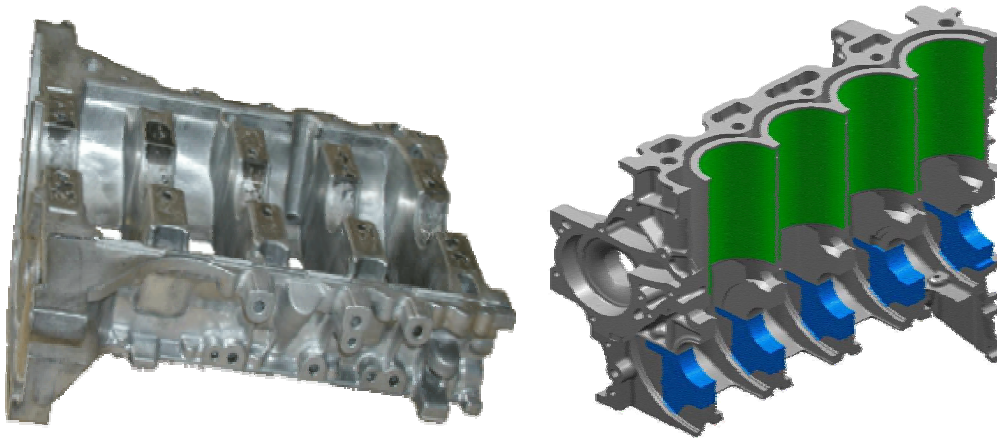
Cooling the top of the cylinders with galleries between the liners



Remarks: Facing the monobloc and boring the cylinders are not envisaged.



Crankcase base



The crankcase base is made of aluminium alloy, with the cast-iron main bearing caps sunk into the casting.

The finishing machining of the supports and main bearing caps is done together with the upper crankcase.

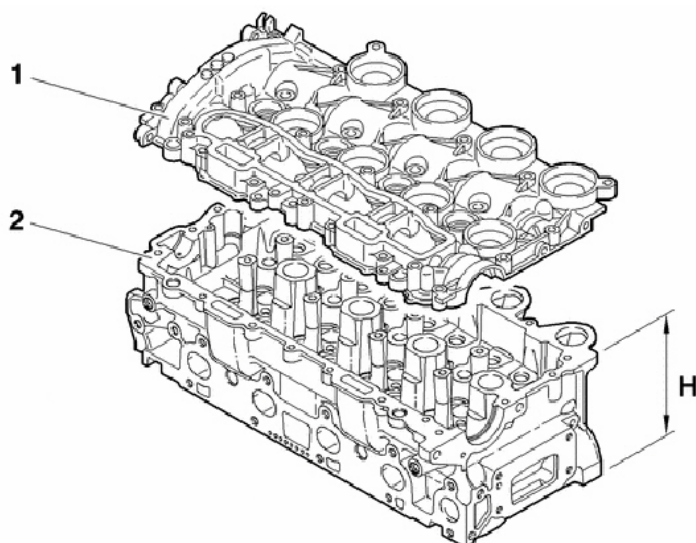
The coupling with the upper crankcase is made with screws and centring pins, which ensure assembly precision.

The crankcase base stiffens the monobloc, main bearing cap and gearbox assembly, limiting crankshaft bending and thereby reducing main journal noise and wear of the bearings.

The features of the crankcase base:

- Light alloy structure that integrates the five cast-iron caps of the crankshaft inserted in the casting,
- No spur for the position on the lower main bearings,
- The crankcase base is secured to the casing-cylinders by 26 screws and 10 solid split pins, (10 M9x125 for the caps and 16 M6x100 for the crankcase base).
- Impermeability between the crankcase base and casing-cylinders is ensured by "single component silicone."



Cylinder head

1. camshaft support casing (tappet cover)

2. cylinder head

H height of cylinder head when new: $H = 124 \pm 0.05$ mm.

Detail:

- material: aluminium alloy
- 4 valves per cylinder
- valve seats: steel
- steel intake valve guides
- steel exhaust valve guides

Permissible flatness error = 0.05 mm

Maximum permissible grinding = 0.4 mm

Cylinder head secured on monobloc with 10 TORX screws



Check length before reusing as prescribed in the manual

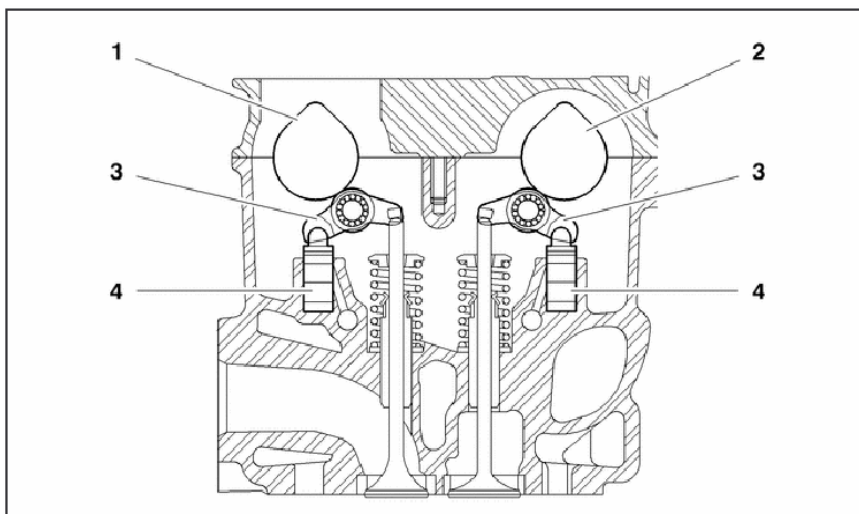
CONSTRUCTION

The cylinder head is made of aluminium and silicon alloy.

The four, parallel and vertical, valves per cylinder are fitted in their respective guides and operated by two overhead camshafts whose cams act on the hydraulic tappets with roller rocker arms placed in between. The valve guides are an interference fit in the seats in the cylinder head and the internal diameter is perfected, after assembly, with a specific reamer.

Compared to heads with a pre-chamber, the entire combustion process takes place in the combustion chamber obtained in the piston.

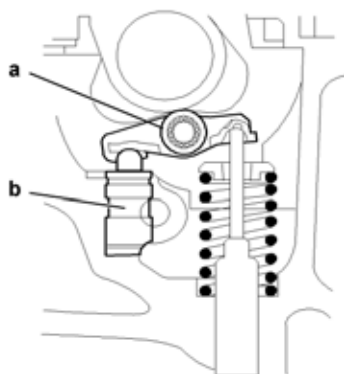




1. intake camshaft
2. exhaust camshaft
3. rocker arm with roller bearing
4. hydraulic tappet

Hydraulic tappets

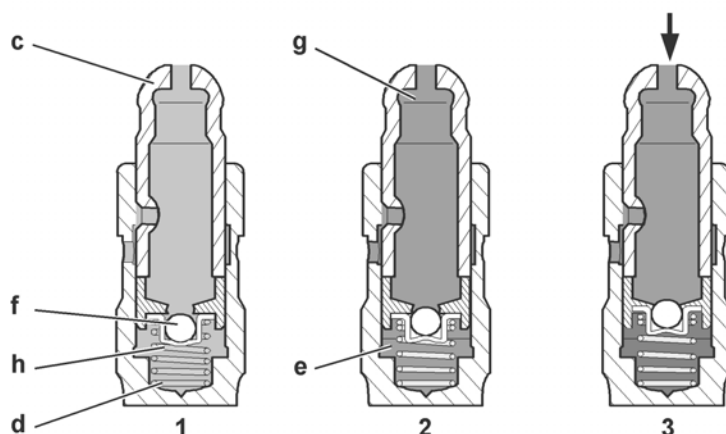
The valves are operated by roller rocker arms whose fixed support is a hydraulic tappet (b, with automatic clearance recovery,).



- a – roller rocker arm
b – hydraulic tappet



Operation of hydraulic tappets



1 and 2 - Phase of clearance recovery between the cam and valves.

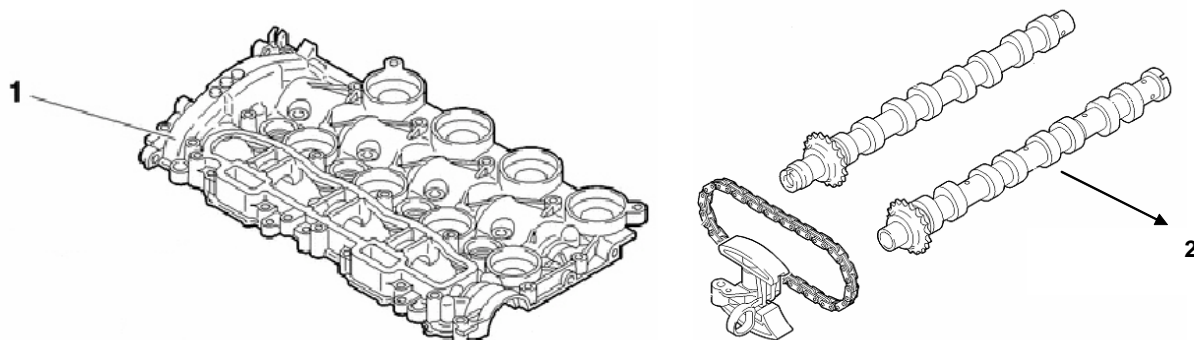
- When there is clearance, the piston **(c)** rises under the action of the spring **(d)**. This movement creates a vacuum in the lower chamber **(e)** that opens the valve **(f)**.
- When the pressure is balanced between the chambers **(g)** and **(e)** the valve **(f)** closes under the action of the spring **(h)**, the two chambers are isolated.

3 – Compression stroke (valve opening).

When the cam rests on the rocker arm, the pressure in the lower chamber (e) rises and pushes the valve (f), in its seat.

Thanks to this hydraulic block, the movement is transmitted entirely to the valve.

Camshaft support (tappet cover)



1. camshaft support
2. intake camshaft



The camshafts are secured with supports to the tappet cover.

The intake camshaft is driven by the toothed belt of the timing system.
The two camshafts are linked together by a chain.
The exhaust camshaft drives the vacuum pump.



Construction

It is made of aluminium alloy and is secured to the cylinder head with screws. There is a bead of sealant between the cover and the cylinder head to prevent oil leakage.

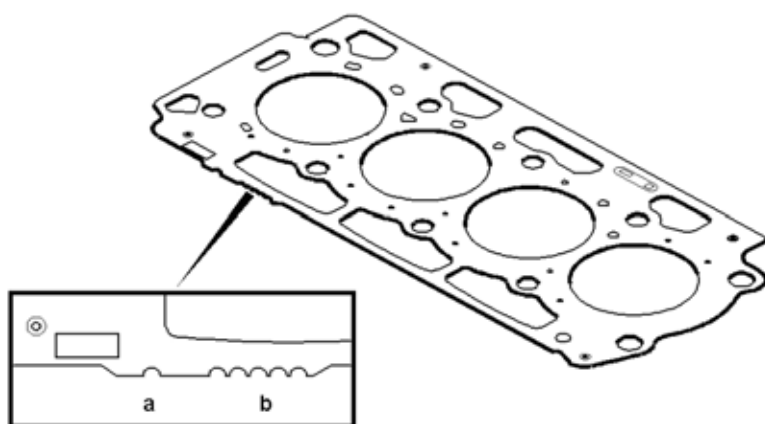
Head gasket



The cylinder head has a multi-layer metal gasket and it is not designed to be retightened for the entire life of the engine.

There are five classes of gasket. The choice depends on the piston stand-out.





“a” shows the type of engine on which it can be fitted

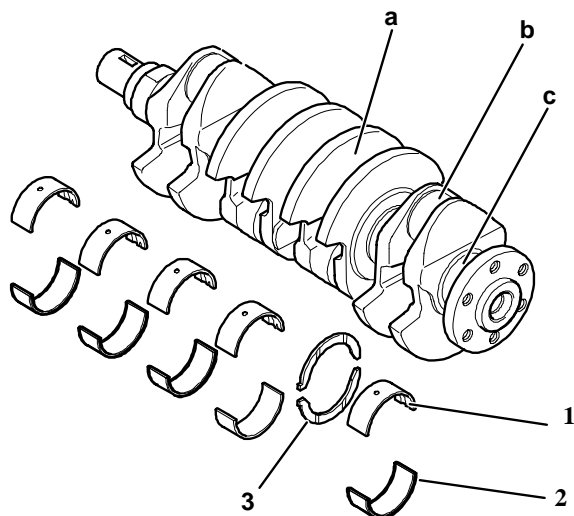
Engine type	Number of reference marks
DV6 TED4	3

“b” shows the thickness

Number of reference marks	Gasket thickness	Piston stand-out DV6 TED4
1	1.35	0.685 - 0.734
2	1.25	0.533 - 0.634
3	1.30	0.635 - 0.684
4	1.40	0.735 - 0.784
5	1.45	0.785 - 0.886



Albero motore



- a. counterweight
- b. crank pin
- c. main journal

- d. upper bearing
- e. lower bearing
- f. thrust bearings

the crankshaft is made of steel and has five supports and eight counterweights.
The side clearance is adjusted at the level of support 2 with two thrust shims.
There is only one class of thrust shims.

The crankshaft is closed between the monobloc and the crankcase base.
The seal between the monobloc and the crankcase base is ensured by a bead of sealant.
The upper bearings are identical and are identified by a mark of black paint.
Whereas there are three classes of lower bearings to be able to adjust the clearances of the shaft line.
These bearings are identified by a mark of paint corresponding to their class.
Fitting the lower bearings requires using a tool.
The upper bearings have a positioning spur.



Bearing identification

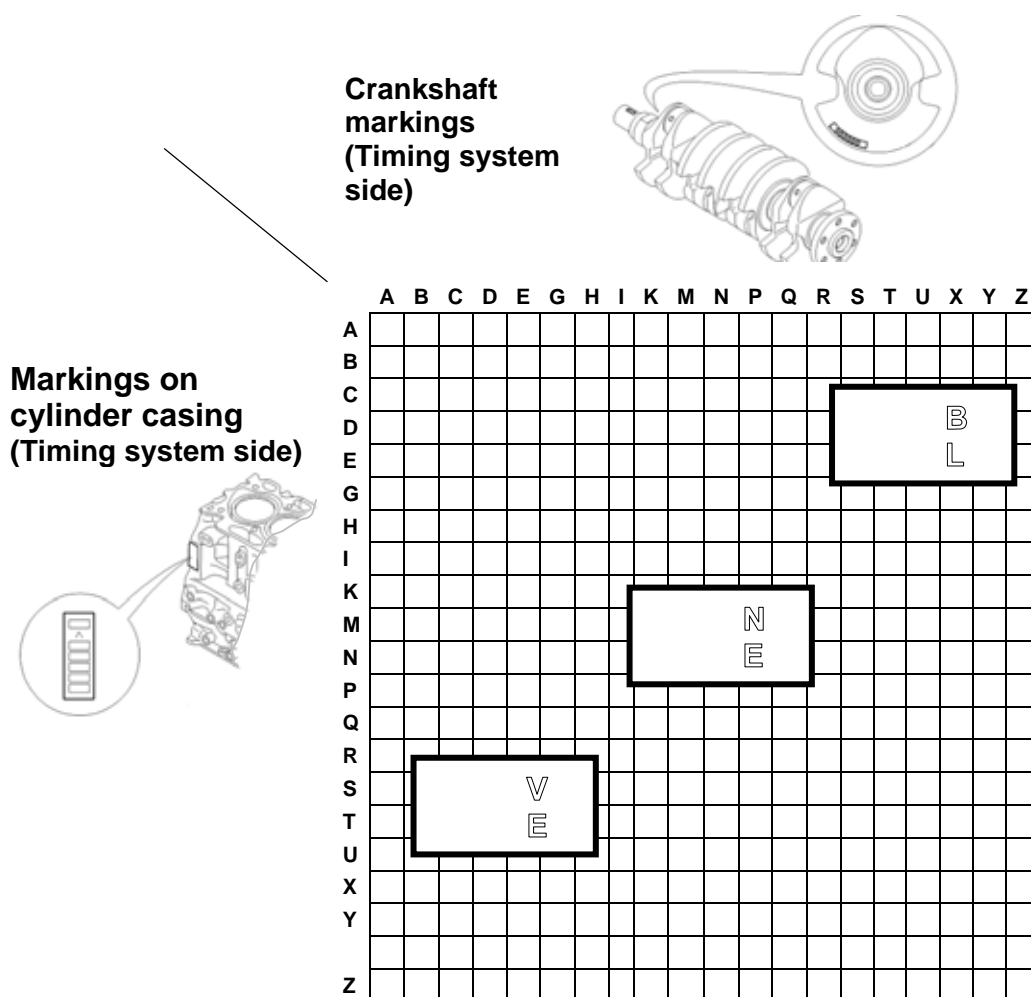
The lower bearings are divided into three classes and are identified by colour. They are made of aluminium alloy and have a screen-printed shell and an internal gallery for oil to flow through for cooling.

A = BLUE

B = BLACK

C = GREEN

The choice of lower bearings is made with the aid of the following diagram.



Volano

CONSTRUCTION

Cast iron, with inserted steel ring gear.

The flywheel is secured to the crankshaft by a flange with bolts.

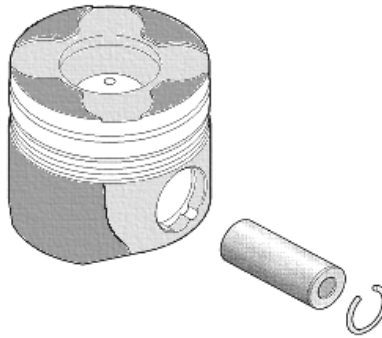
OPERATION

The flywheel is an energy storage device that stores energy during the power stroke and gives up energy during the combustion stroke to smooth out engine rotation.



Flywheel size is designed to enable engine idling and overcome friction developed during idling.

Pistoni



This member, on receiving the engine pulse directly from the pressure of the combustion gases, via the connecting rod, transmits the drive to the crankshaft.

The piston comprises two parts:

- head, or area where the piston rings sit; its diameter is slightly smaller than the cylinder bore to accommodate heat expansion.
- Skirt or guide block of the connecting rod small end which withstands its axial thrust. The skirt accommodates two sleeves for the gudgeon pin.

They are made of aluminium alloy, with a toroidal sombrero-type of combustion chamber on the head, suited for swirling the gases, and the seats for the valves.

The two areas of the skirt have a graphite coating, with a low coefficient of friction.

The gudgeon pin is the floating type and is held by two rings that prevent it from coming out.

The piston orientation is given by the arrow and the marking "Dist".



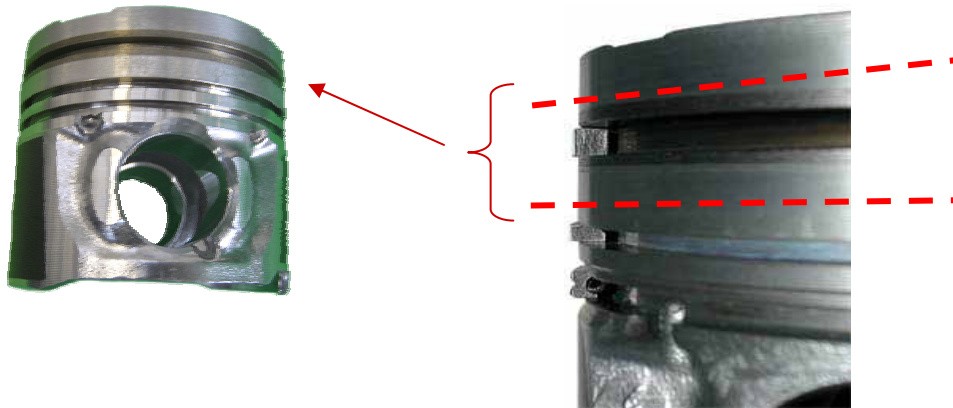
An internal oilway has been made inside the pistons, with the oil being sprayed by special nozzles to better dispose of the heat from the area of the head.



Piston rings

In the area of the head of the piston there are three grooves accommodating three piston rings: two for compression and seal to ensure gas tightness and in addition keep the sliding surfaces constantly lubricated and a scraper ring that prevents the lubricant from flowing into the combustion chamber.

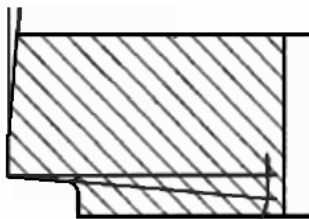
The seat of the first compression ring is made of steel to withstand the mechanical stress better.



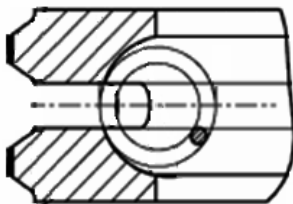
The compression ring is a semi-inserted double trapezium. It is inserted in an appropriate steel seat.



The seal ring has a tapered profile and is coated with chromium to eliminate the risk of consumption.



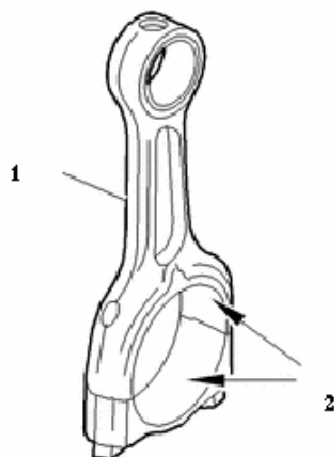
The scraper ring is laminar with a spiral spring and chrome-plated tapered profiles.



Connecting rods

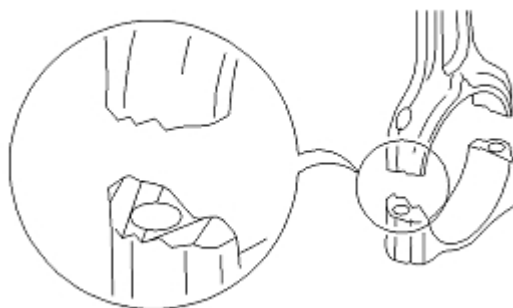
The connecting rod is the main element joining the piston with the crankshaft. It is composed of a body or leg, with a straight axis, that rigidly joins the connecting rod small end, pivoted to the gudgeon pin with a bushing in between, and the connecting rod big end, pivoted in the button or crank pin with bearings in between.

TT DV6 connecting rods:



1. connecting rod body
2. bearing shells

The connecting rod big ends are fracture split by an expanding mandrel after tracing with a laser.

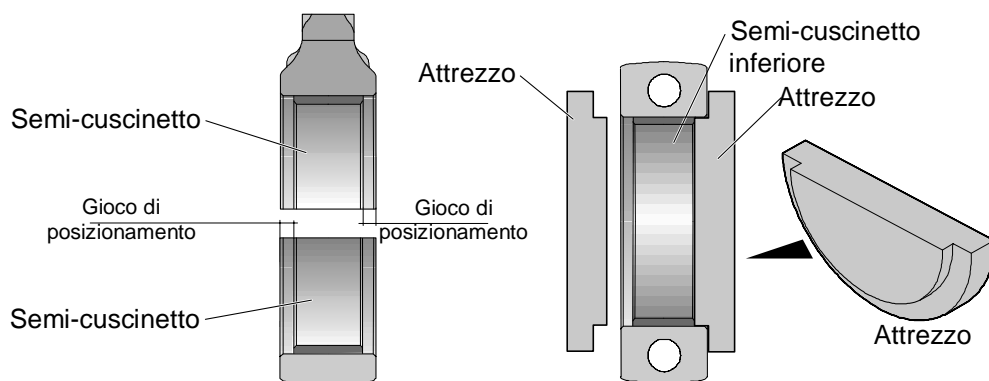


Precautions for repairs.



- During disassembly, mark the bearing shells as there are no reference marks.
- When fitting the lower bearing shells you need to use a specific template as there is no positioning spur.





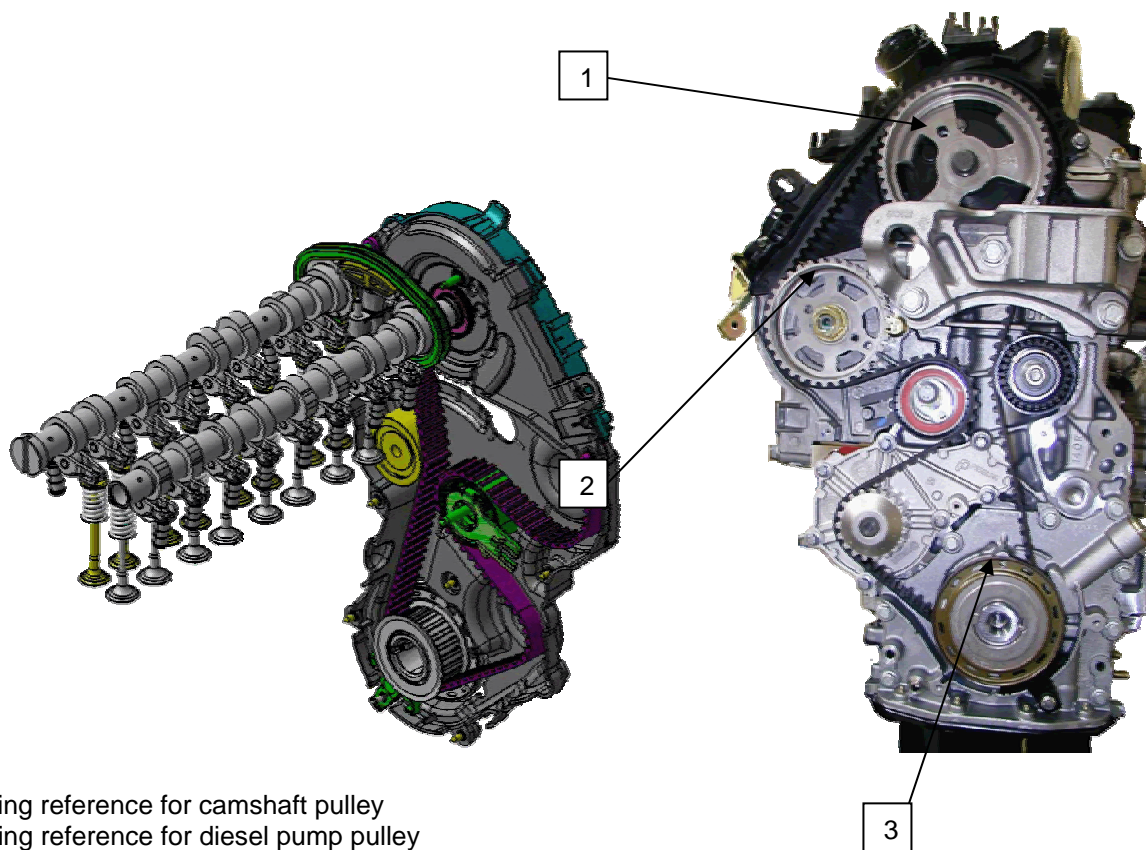
Camshaft drive

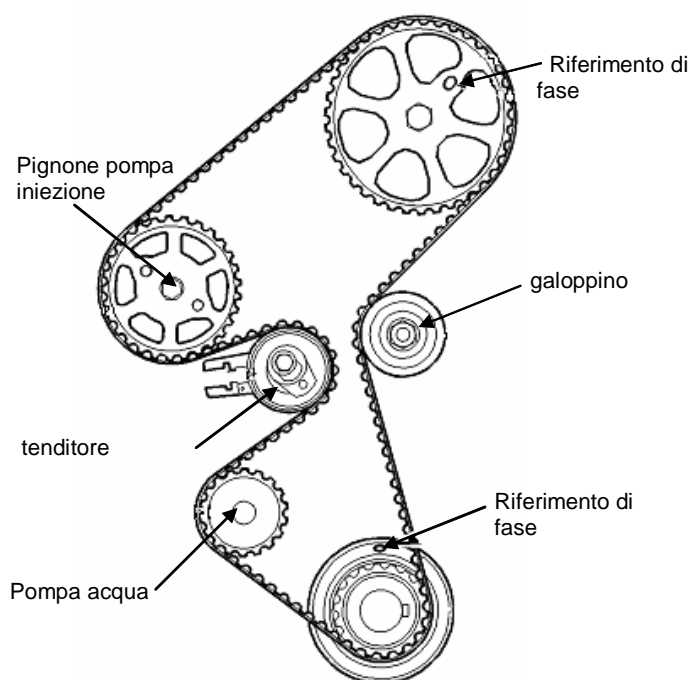
Features

The timing system is driven by a teflon toothed belt 25.4mm wide and equipped with 137 teeth.

Renewing the timing belt is not envisaged.

The belt drives the intake camshaft that in its turn drives the exhaust camshaft with a chain with single links.

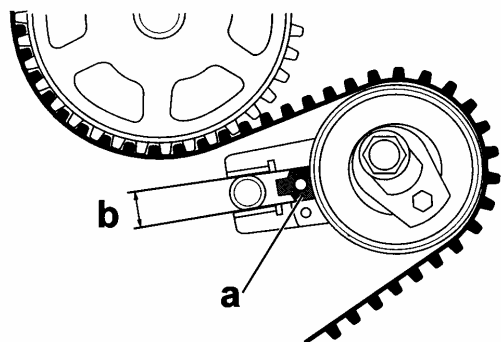




Spring tensioner

CONSTRUCTION

Timing chain tension is controlled by an automatic tensioner that eliminates the need for tension adjustments.



Camshafts

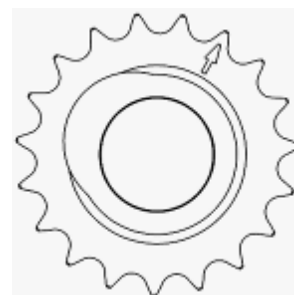
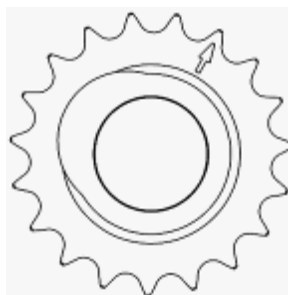
The camshafts are tubular with steel cams, inserted.

The purpose of this method of manufacture is to decrease the weight.



The motion is transmitted from the crankshaft to the intake camshaft by a toothed belt and from the intake camshaft to the exhaust camshaft by a chain with the hydraulic tensioner in between.

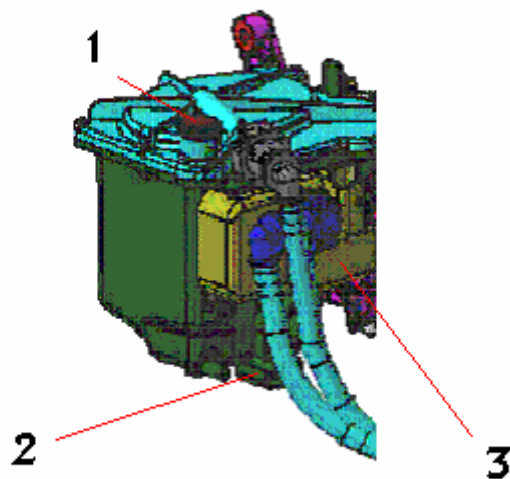
Shaft timing is done by making the two coloured links of the chain coincide with the marks on the gears (7 links between the two marks).



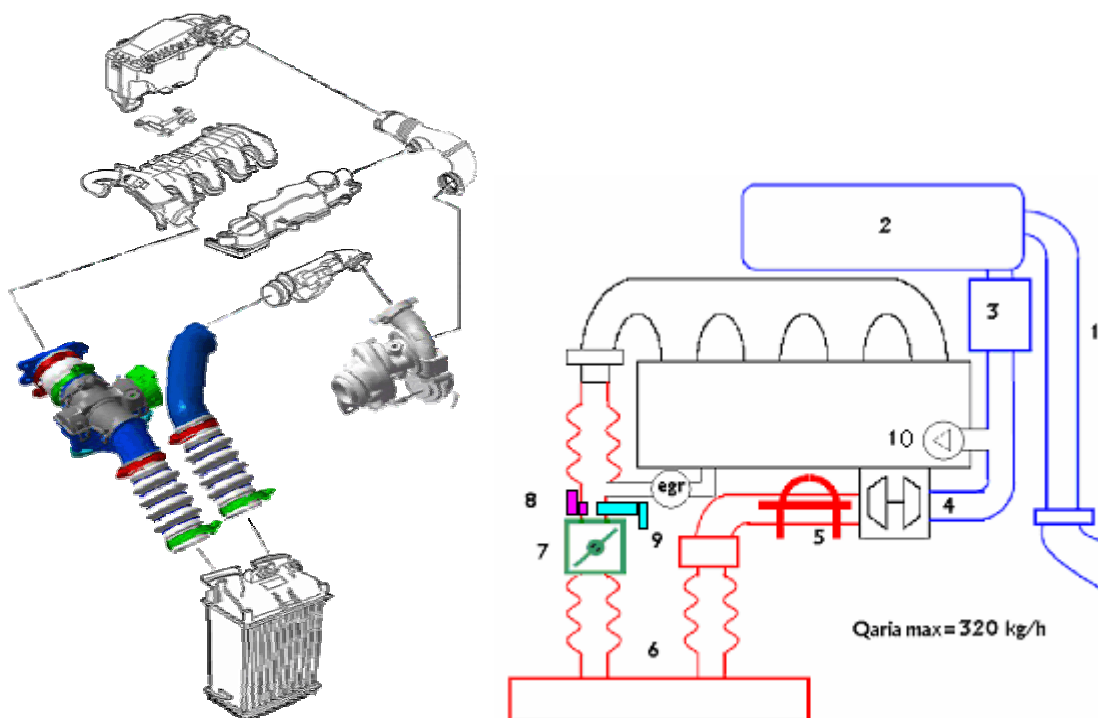
Fuel filter

The fuel filter is fitted on the engine on the flywheel side.

The fuel filter is equipped with a bleed valve (1), a moisture sensor (2) and a diesel heater (3).



Air supply circuit diagram



1. Air inlet
2. Air filter
3. Air flow meter
4. Turbo inlet
5. turbo noise attenuator

6. Intercooler
7. Flow meter
8. air pressure sensor
9. air temperature sensor
10. oil vapour valve

Air route

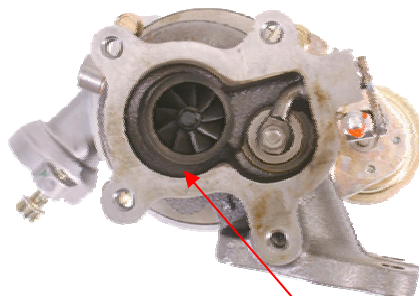
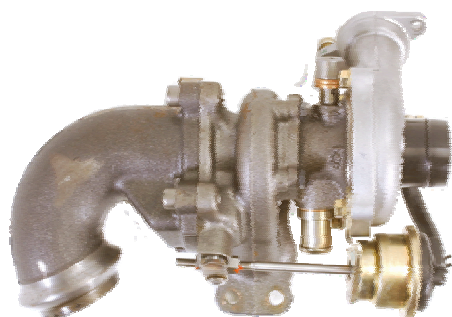
1. The intake air passes via the filter (2)
2. It crosses the air flow meter (3) where the mass and temperature are measured
3. It passes via the turbine (4), where it is compressed to increase the volumetric efficiency of the engine
4. It crosses the air/air heat exchanger (6) (intercooler) that lowers its temperature (this stage is useful to recover the loss of air density due to the effect of the increase in temperature during the compression stroke in the turbine).
5. The flow of air can be metered during the phase of action of the EGR by a throttle valve body (7) to create a pressure difference that helps exhaust gas intake.
6. Immediately afterwards the pressure and temperature are detected via the relevant sensors (8) and (9)
7. It is divided into the cylinders by the manifold.

Another two systems interact in the intake circuit:

- Oil vapour recirculation
- Exhaust gas recirculation



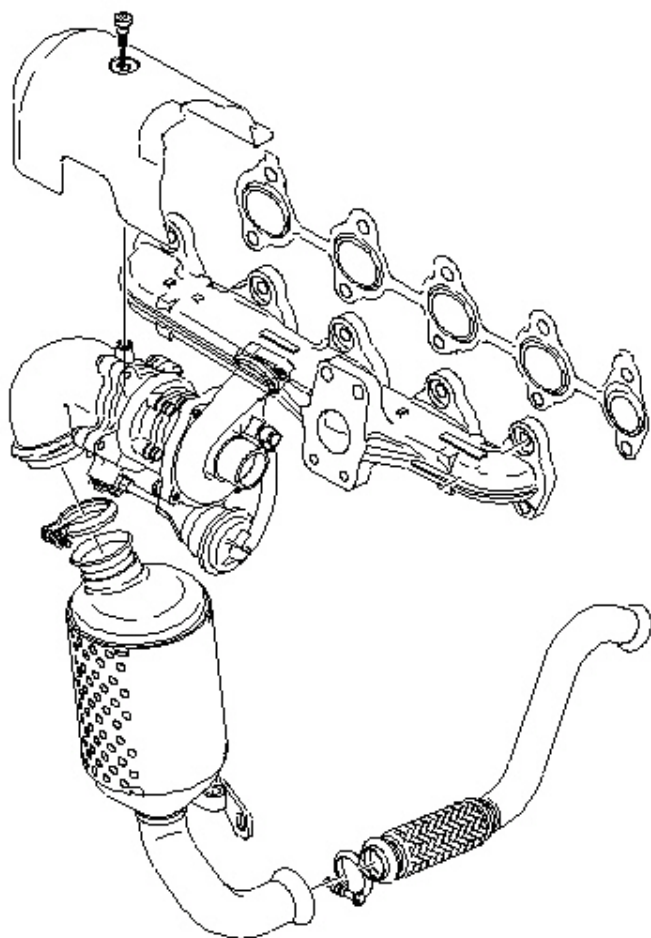
Turbocharger

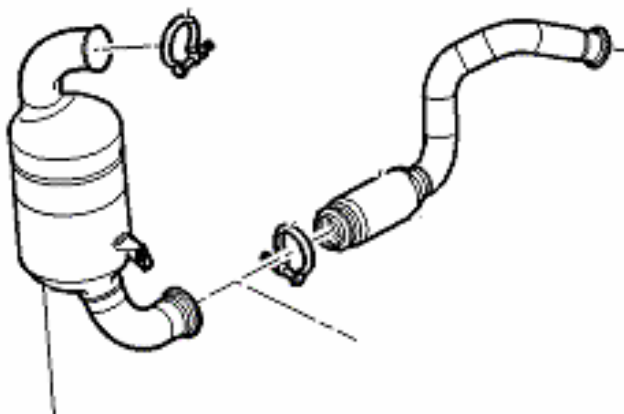


ADJUSTMENT VALVE

It is of the Fixed Geometry type and permits turbocharging.
The turbocharging pressure is regulated by the "regulating" valve.

Exhaust system



Catalytic converter**catalizzatore****EGR system**

This system recirculates part of the exhaust gases to the intake under certain particular operating conditions.

This lowers peak temperature in the combustion chamber so as to reduce nitrogen oxide (NOx) formation. The E.G.R. solenoid valve governed by the injection control unit, performs the function of introducing some of the exhaust gases taken from the exhaust manifold (4) into the engine intake.

A heat exchanger enables partial cooling of the exhaust gases thereby helping to lower the combustion temperature and as a result the NOx.

The control percentage can vary from 0% (when you want to leave the passage of the exhaust gases closed) to 100% (when you want to fully open the passage of the exhaust gases).

A position sensor is mounted on the EGR.

The injection control unit continually monitors the quantity of recycled gas via the information from the air flow meter: In fact, if a certain amount of air (Qam) is to be sucked with a given engine speed, and the value provided by the air flow meter (Qar) is smaller, the difference (Qgr) will be the value of the recirculated gas amount.

$$Q_{am} - Q_{ar} = Q_{gr}$$

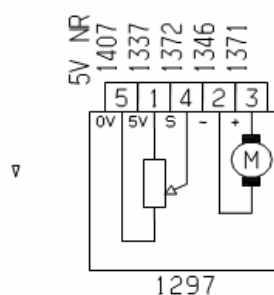
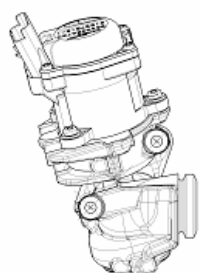
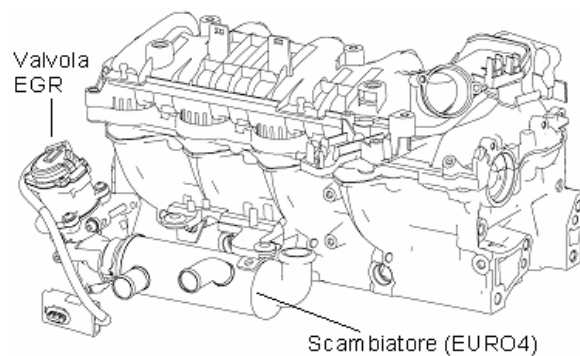
Qam - Stored theoretic air amount

Qar - Actual air amount

Qgr - Quantity of recycled gases

The atmospheric pressure signal is used when controlling the E.G.R. solenoid valve to identify the condition of driving at altitude so as to reduce the quantity of recycled gas and prevent engine smokiness.





Pin 1: + 5 V
 Pin 2: Ground
 Pin 3: EGR command (RCO)
 Pin 4: EGR position signal
 Pin 5: Ground

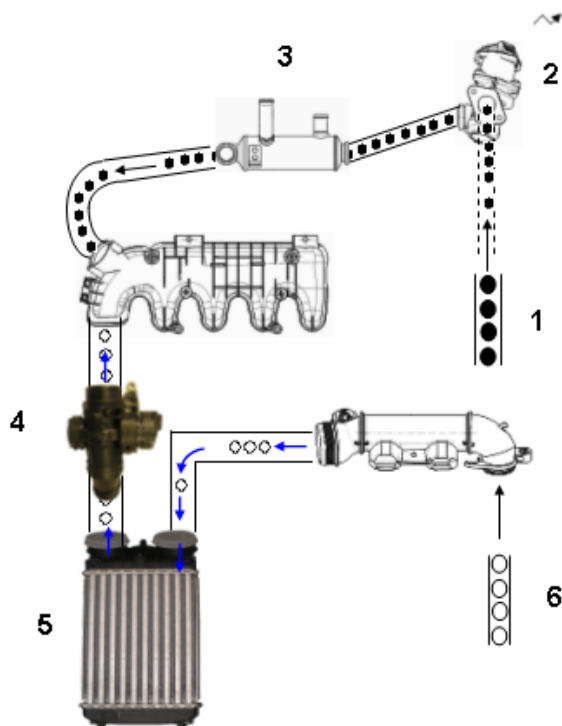
Resistances between:

- pin 2 and 3 = 4 ? (EGR motor)
- pin 1 and 5 = 5870 ? (potentiometer track)
- pin 1 and 4 = 0.17 ? (with EGR closed)
- pin 5 and 4 = 5950 ? (with EGR closed)



Flow meter

In the intake circuit, between the intercooler and the intake manifold, there is a throttle valve body (air flow meter) that is normally open; when commanded it reduces the flow of air so as to create a vacuum that helps the gases from the EGR enter the intake. Its operation is therefore subordinate to that of the EGR.



1. Exhaust gas leaving the head
2. Solenoid valve for regulating and recycling the exhaust gases
3. EGR heat exchanger
4. Flow meter throttle valve
5. Air/air exchanger (intercooler)
6. Air leaving the turbo

The throttle valve moves by means of a motor governed by the engine control unit and its position is controlled by a sensor as follows:

THROTTLE VALVE POSITION	Control percentage	Return signal in relation to ground	Control		Remark
			BSM	CCM	
	100%	1v	12v	12v	No difference in potential
	99% and 1%	between 1v and 4v	12v	Partial grounding	Progressive increase in potential difference by the CCM
	0%	4v	12v	Complete grounding	12v potential difference



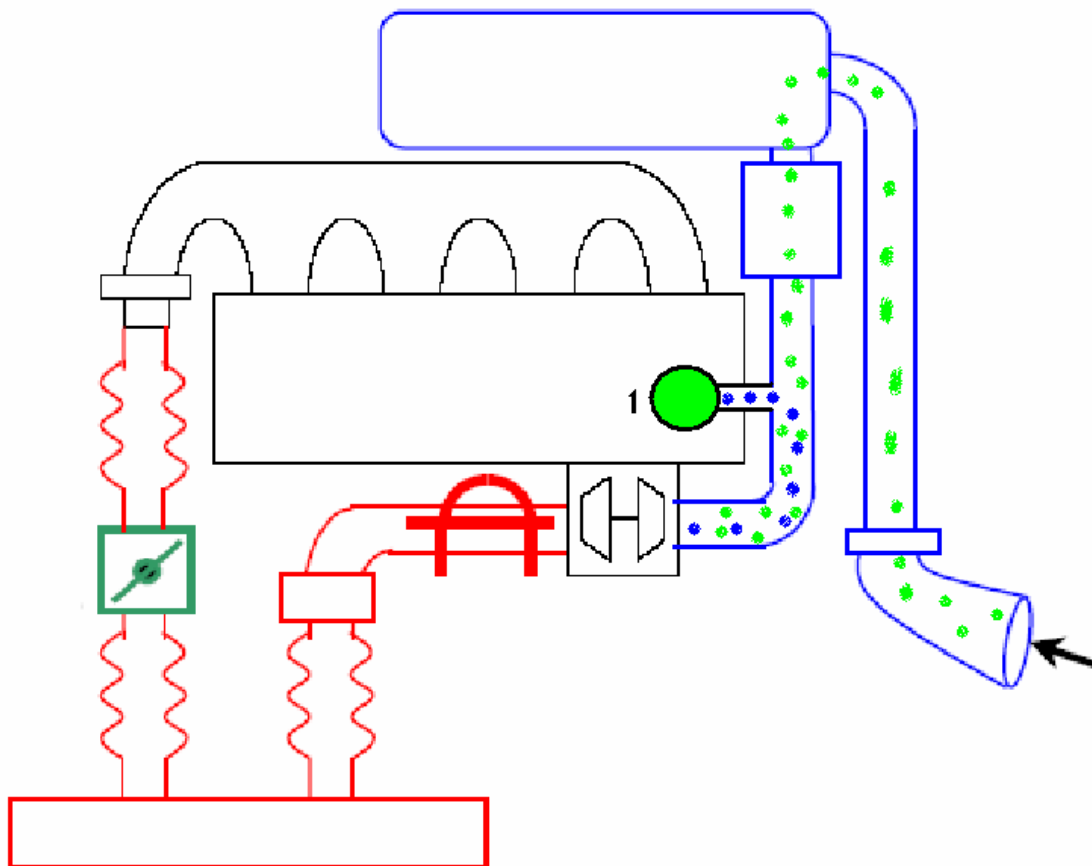
Particular conditions

The flow meter throttle valve functions at constant speed or in acceleration with a temperature greater than 15°C and altitude between 0 and 1000 m.

This means that with a temperature under 15°C and altitude greater than 1000 m the intake air flow is not modified.

Crankcase oil vapour recovery system

The oil vapour emissions are controlled by a system of internal galleries that convey the vapours released from the crankcase towards the cover (1) that produces partial condensation.



The already condensed vapours are sent to the air intake sleeve before the turbocharger.

There is a regulating valve on the vapour transfer cover with a spring that, under normal conditions, acts on a diaphragm keeping it open, thereby allowing the oil vapours from the oil separator to flow through.

When the vacuum inside the pipe exceeds the spring setting, it moves the diaphragm thereby closing the gallery from the oil separator preventing oil intake from the sump.

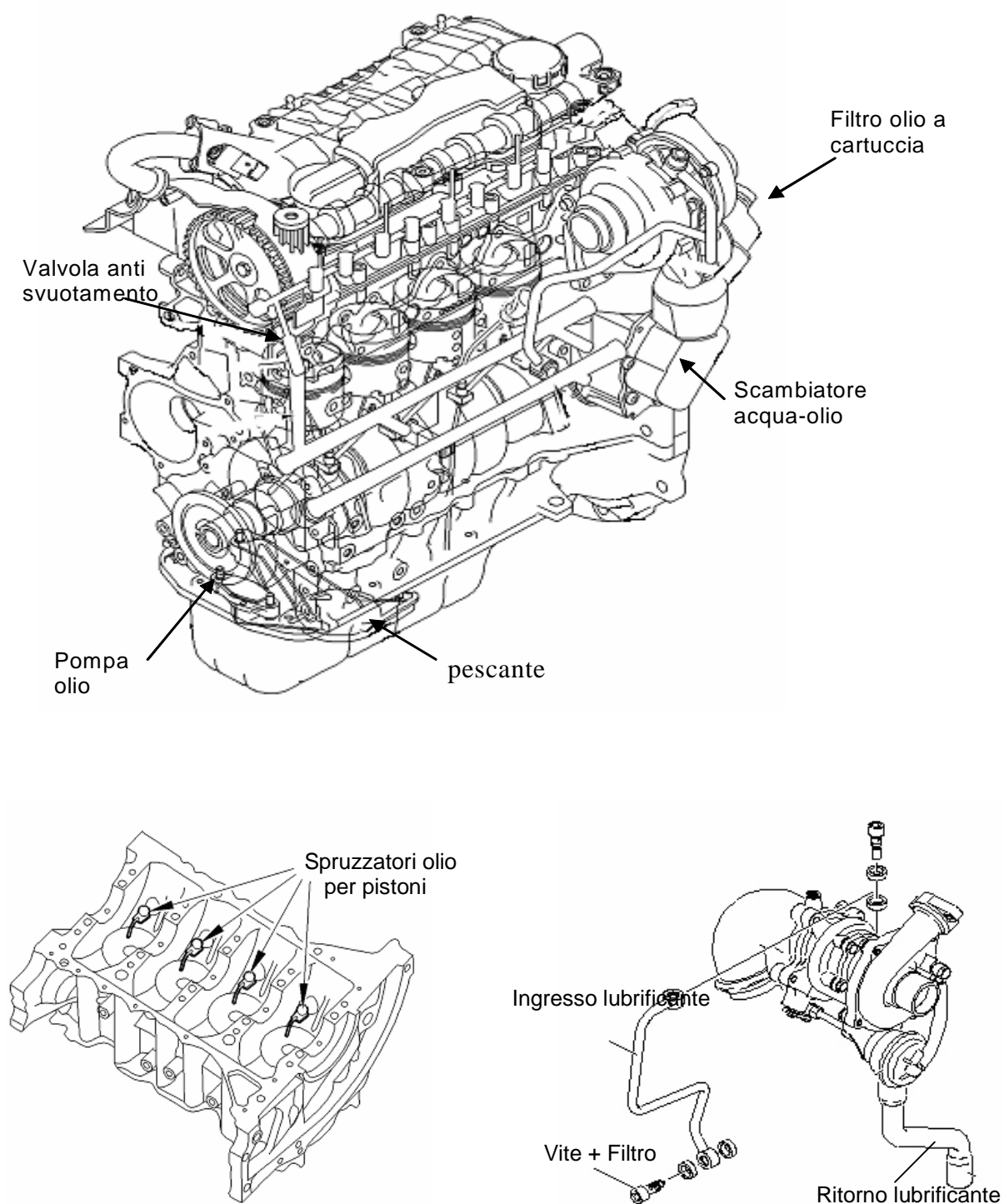


Engine lubrication system

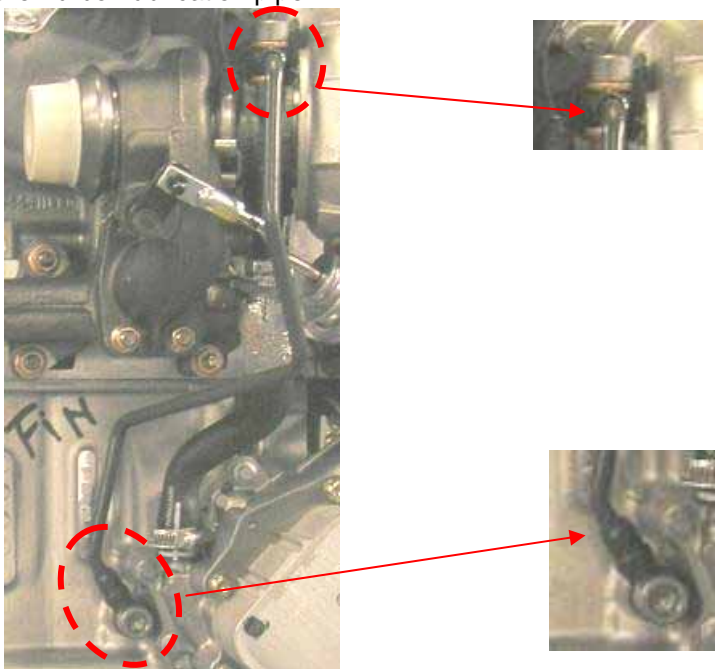
The system is originally filled with 6.2 litres of oil. For subsequent changes use 5.8 litres since it is estimated that 0.4 litres remain in the circuit.

Circuit

The following figure shows the lubrication circuit.



Detail of the Turbo Lubrication pipe



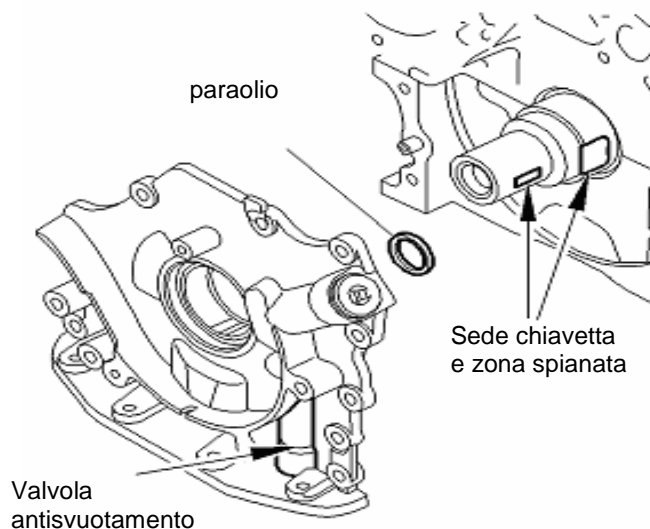
The Turbo Lubrication pipe is not rigid: it has articulated couplings at the ends.
With no oil pressure the pipe is slack, as soon as the oil pressurizes the pipe stiffens and the seal is ensured.



Oil pump

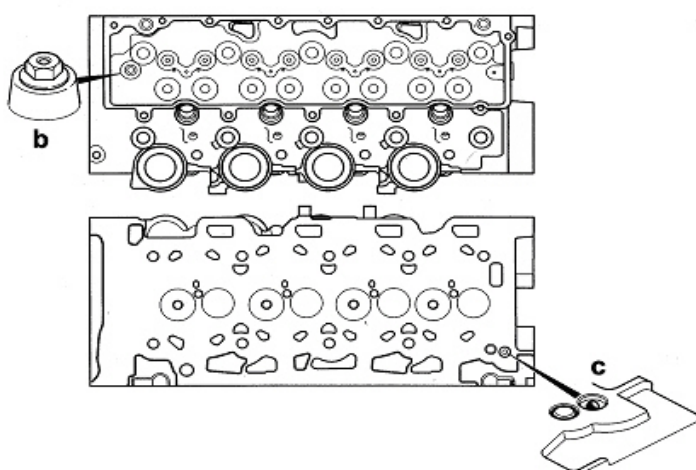
The oil pump is driven by the crankshaft. The impermeability between the oil pump and the cylinder casing is ensured by a sealing paste. An anti-drain valve is fitted on the pump. A pressure limiter **(b)** located on the lubrication line of the camshaft supports limits the pressure at the top of the engine. An anti-drain valve **(c)** fitted in the head holds back a quantity of oil necessary for operation of the tappets.

View of the oil pump



Oil

View of the head



pressure

The oil pressure values must be greater than 1.3 Bar at 1000 rpm and greater than 3.5 Bar at 4000 rpm. The pressure is measured at the level of the oil filter using the reducer tool that replaces the oil filter cover.

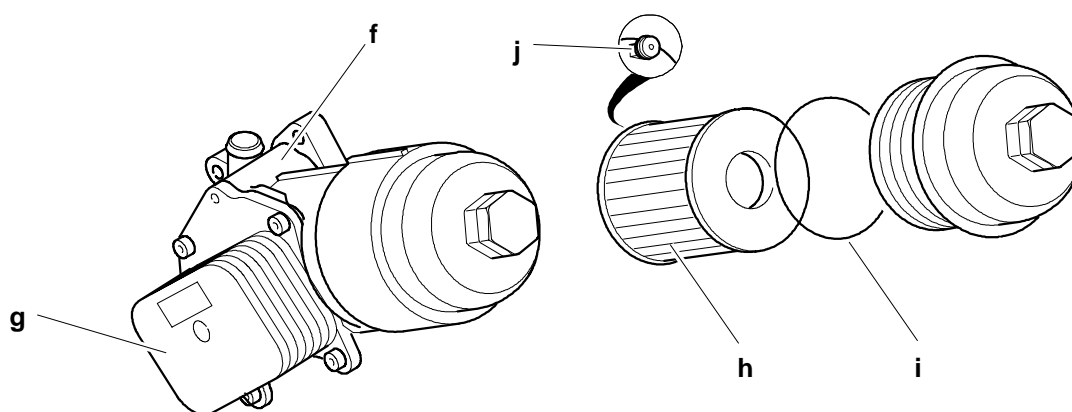


Oil filter and heat exchanger

The paper filtering cartridge (**h**) is separated from the casing-cylinders by a specific support (**f**).

The latter also integrates a "water/oil" heat exchanger (**g**).

A valve (**j**) on the filtering cartridge helps drain off the oil after removing the cover.

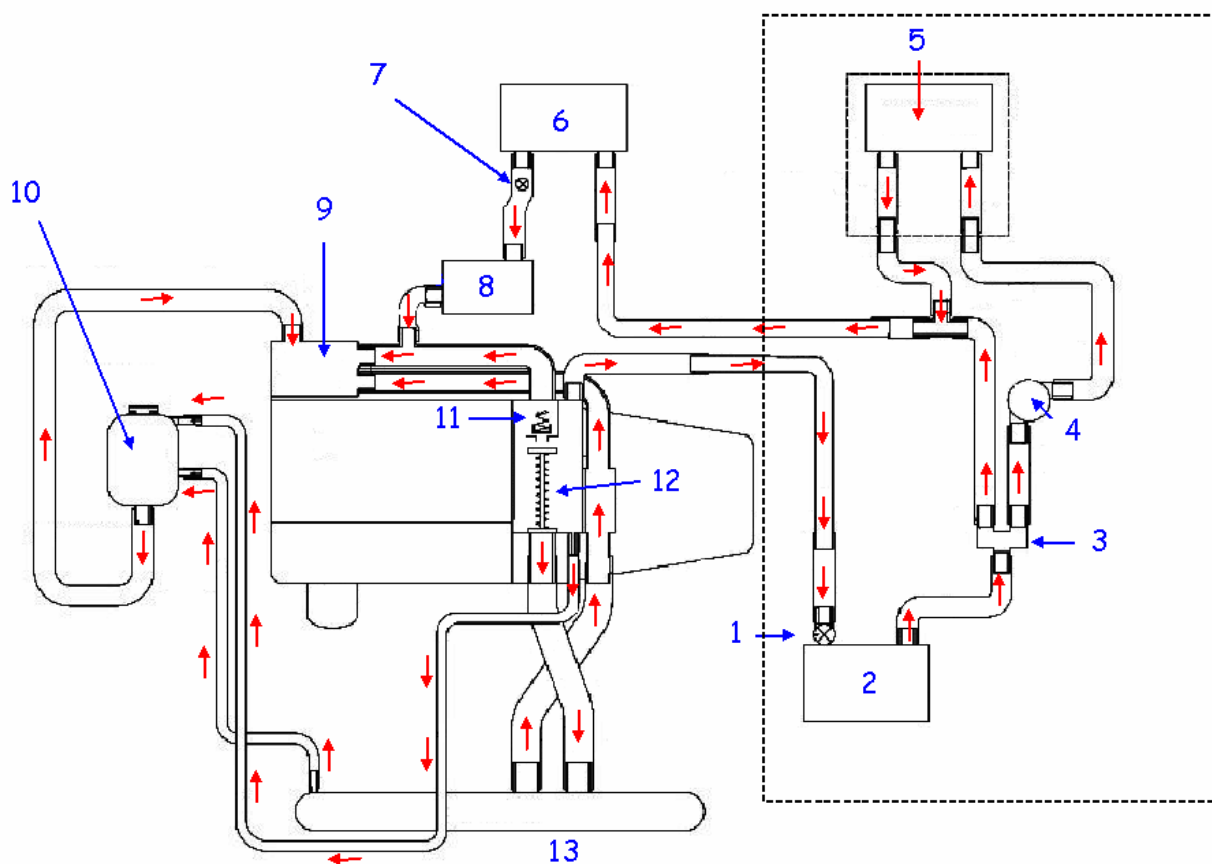


- f - Support
- g - Exchanger
- h - Cartridge
- i - gasket
- j - Valve (assembly reference)



Engine cooling circuit

The figure below shows the layout of the engine cooling circuit.
The dotted portion shows the additional heater circuit (OPT).

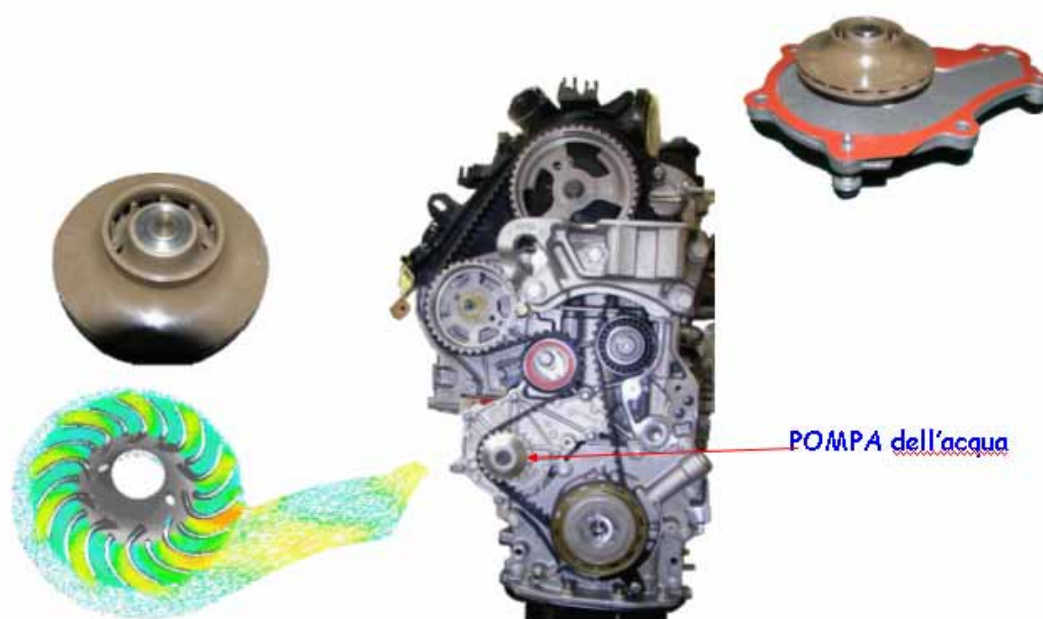


- | | |
|--|--|
| 1. Additional heater water pump | 7. Bleed screw |
| 2. Additional burner | 8. EGR exchanger |
| 3. 3-way solenoid valve | 9. Water inlet coupling to the engine coolant pump |
| 4. Additional water pump Additional CLIM | 10. Expansion tank |
| 5. ADD CLIM secondary radiator | 11. By-pass valve |
| 6. Radiator inside passenger compartment | 12. Double acting thermostat |
| | 13. Radiator |



Coolant pump

Centrifugal vane pump secured to the crankcase and operated directly by the timing belt.



Thermostat

It is fitted on the rear side of the cylinder head, and is used to keep the engine at the optimum temperature:

- with temperature $< 83 \pm 2^{\circ}\text{C}$ the thermostatic valve (closed) conveys the coolant towards the coolant pump.
- with temperature $> 83 \pm 2^{\circ}\text{C}$ the thermostatic valve starts to open, until it is fully open at 95°C , diverting the flow of coolant towards the radiator.

The engine coolant temperature sensor is fitted on the body of the thermostat and connected to the Engine Control Node.

Supply/Expansion Tank

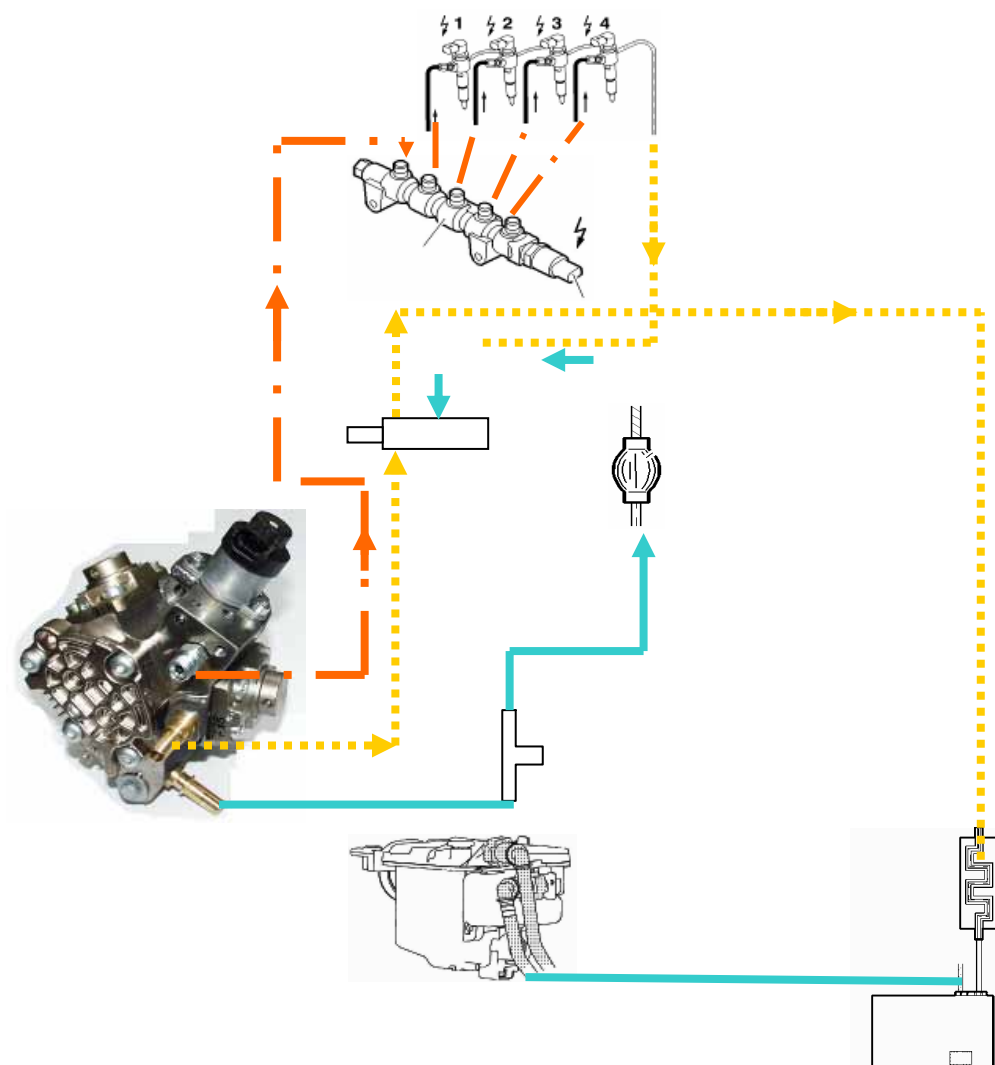
The tank feeds coolant to the circuit and takes up excess coolant when it expands from heat as engine temperature rises.



A calibrated valve in the sealed plug

- lets air exit the circuit; this is the air drawn from the pipe coming from the thermostat.
- air flows in when the circuit is in vacuum condition (due to engine cooling)

Fuel circuit

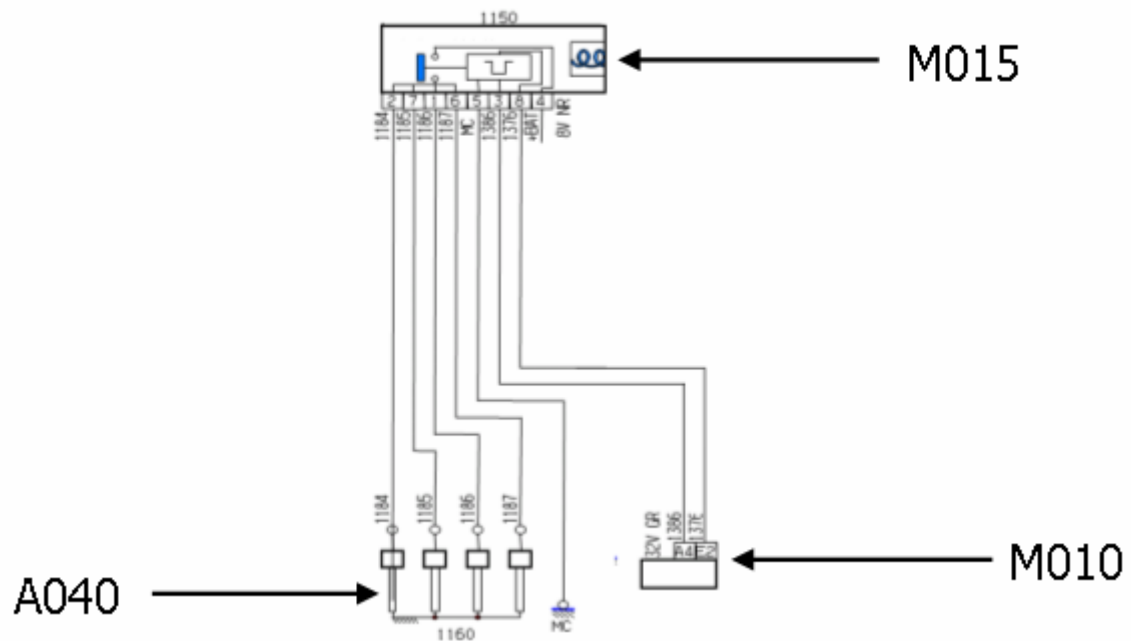


List of Equipment for 1.6 Multijet 90CV Engine

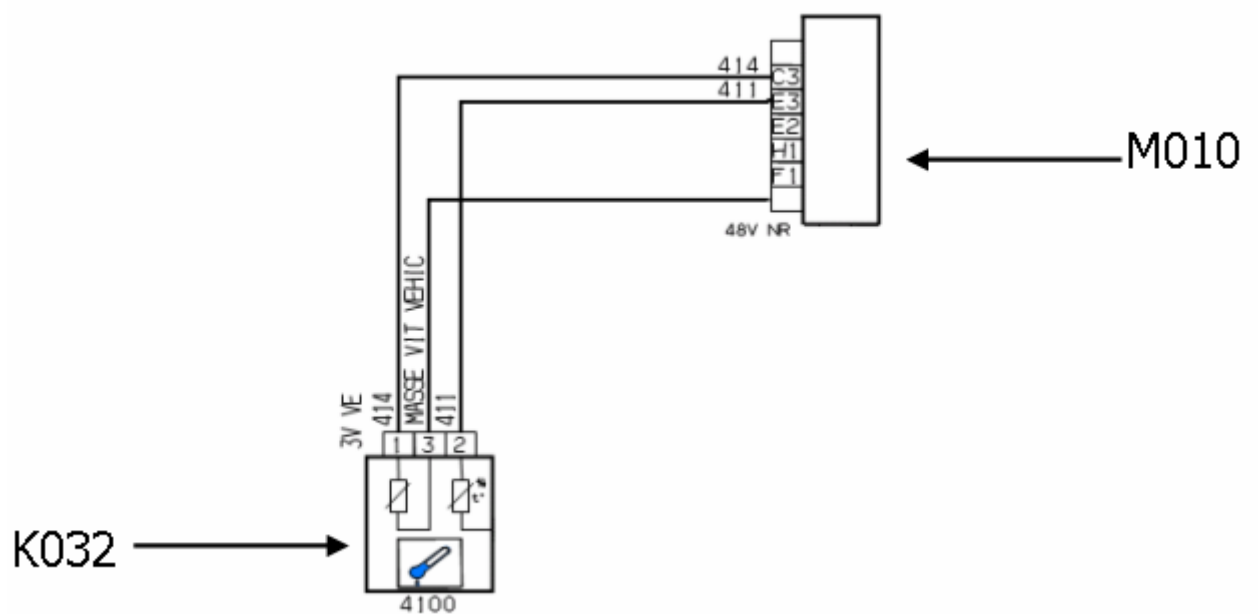
Designation	Code	Function
Blade	1,870,718,000	Blade
plate	1,845,028,000	plate
plate	2,000,005,000	plate
drift tool	1,870,465,000	drift tool
drift tool	1,870,426,000	drift tool
slide hammer	1,870,007,000	slide hammer
drift tool	1,870,632,000	drift tool
drift tool	1,860,990,000	drift tool
Flywheel locking tool	2000022500	
Wrench for r.i. Ring nut on Fuel pump	2000022600	
Valve guide drift tool	2000022700	
Valve spring compressor cage	2000022800	
Cylinder head cover centring pins	2000022900	
High pressure fuel pump timing pin	2000023000	
Crankshaft pulley timing pin	2000023100	
Camshaft pulley timing pin	2000023200	
Corteco drift tool on crankshaft flywheel side	2000023300	
Corteco drift tool on crankshaft timing system side	2000023400	
Corteco drift tool on camshaft	2000023500	



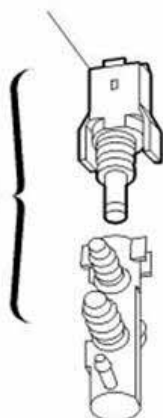
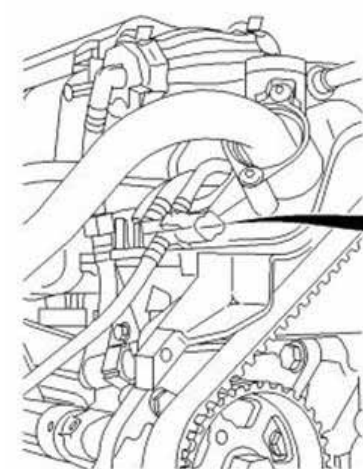
Glow plug pre-heating system



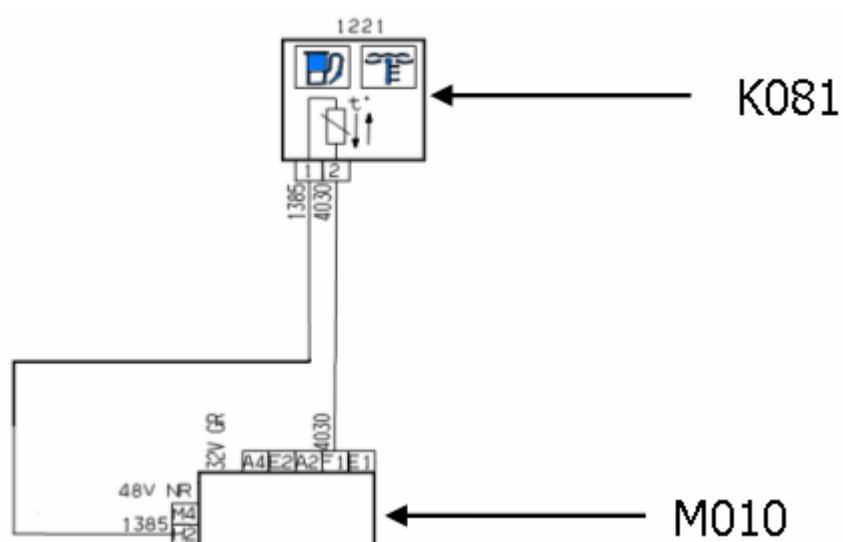
Engine oil temperature and level sensor



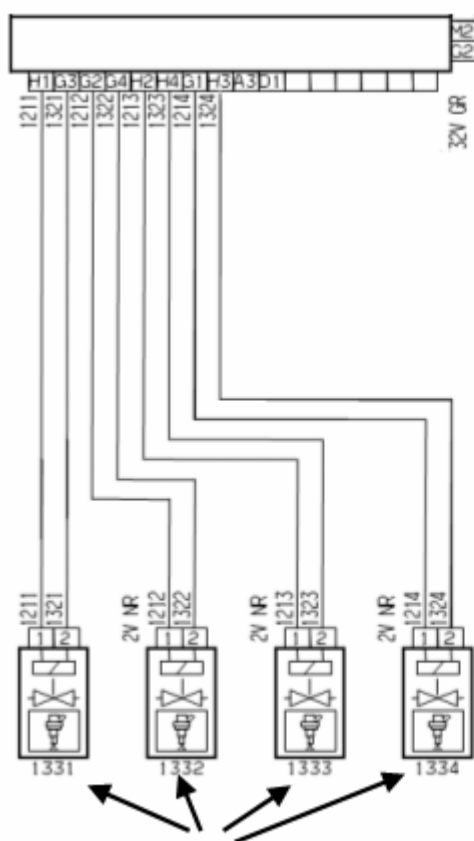
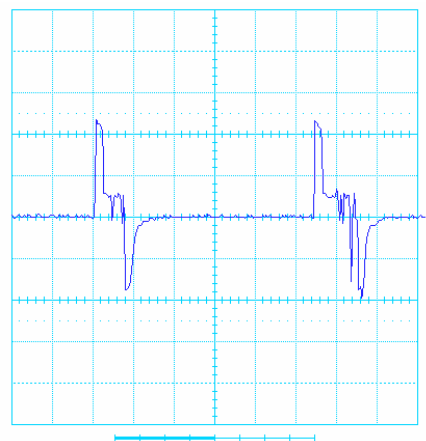
Fuel temperature sensor



T° en °C	CAPTEUR T° GASOIL	
	RESISTANCE Mini	RESISTANCE Maxi
-40	79999.99	189535.40
-30	41254.99	55556.92
-20	22394.34	29426.67
0	7351.14	9247.9
20	2742.72	3323.46
40	1141.48	1338.74
60	522.25	595.19
80	259.21	287.99
100	139.1	149.99
120	77.88	83.63
130	59	64,00



Electro-injectors

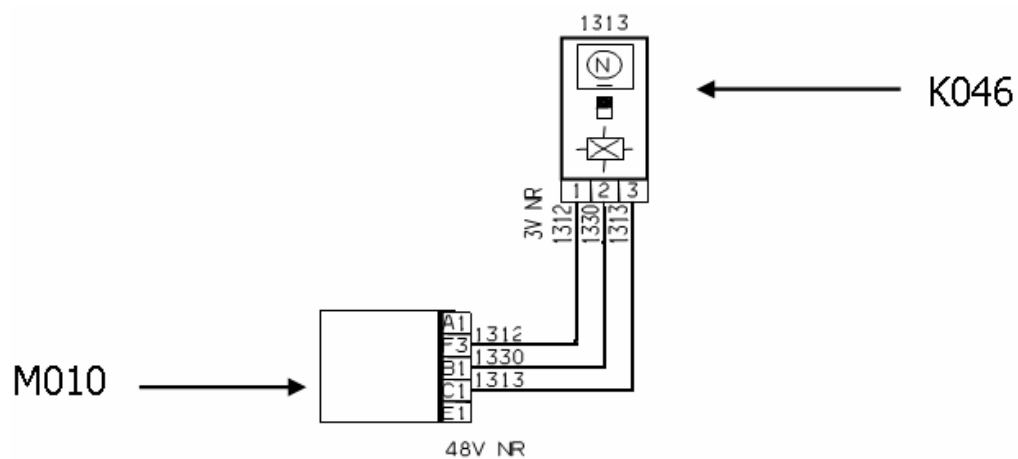


← M010

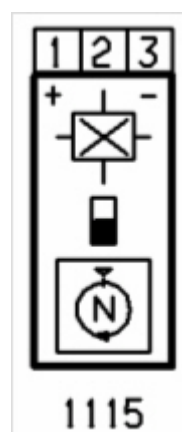
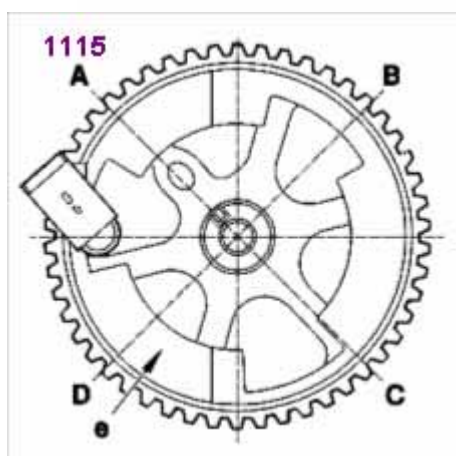
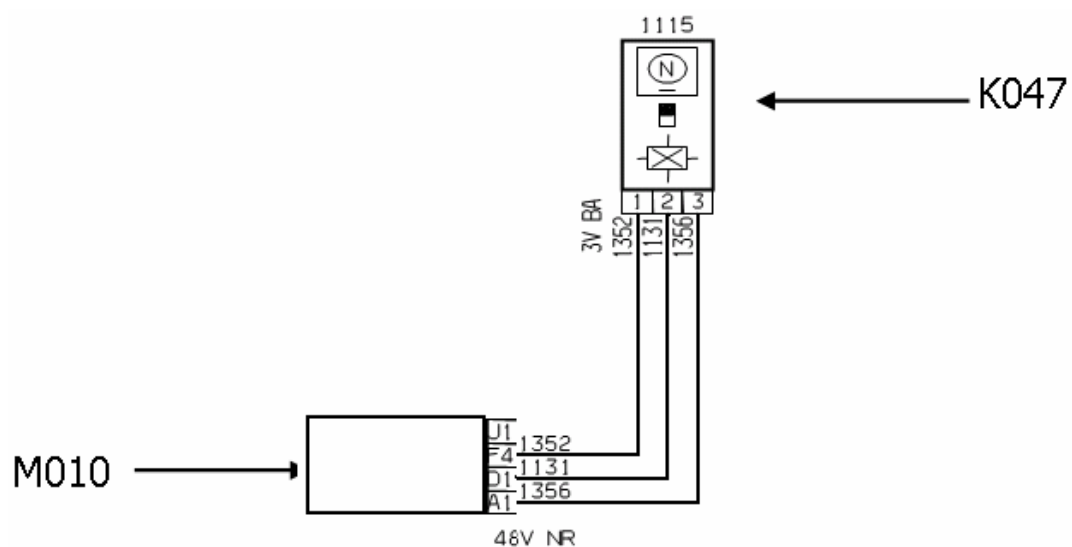
N070



Rpm sensor

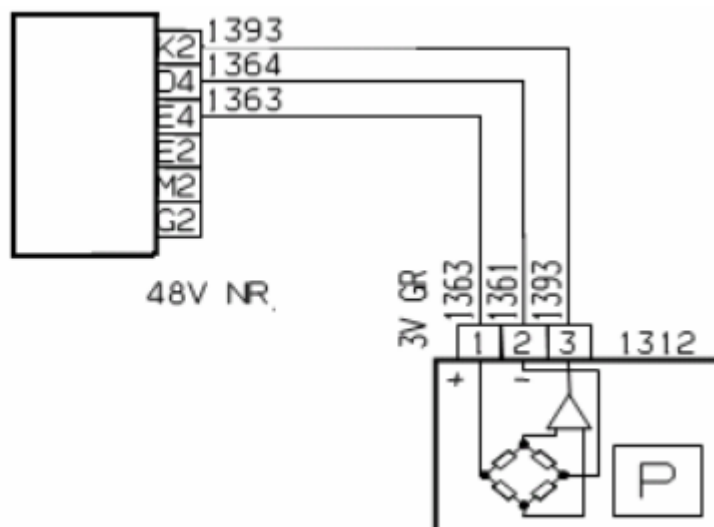


Timing sensor

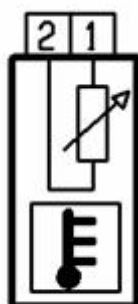


Overpressure sensor

M010

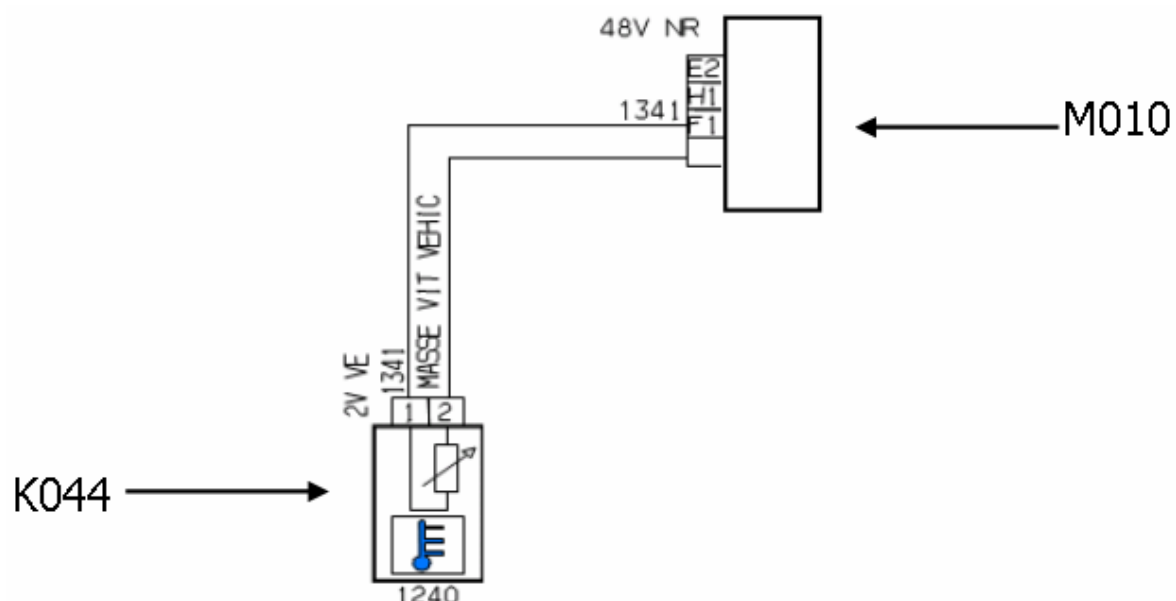


Sucked air temperature



1240

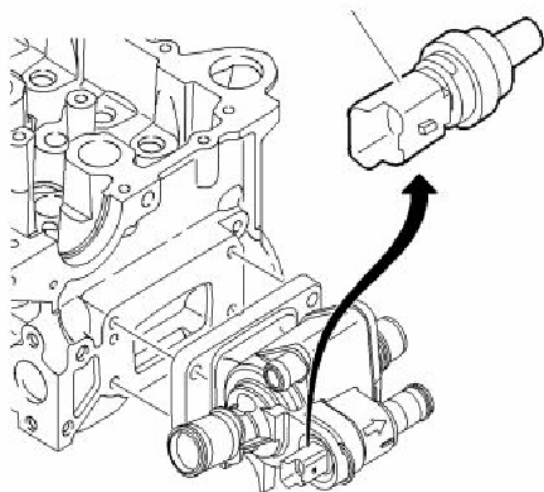




Température °C	Résistance Nominale Ω	Température °C	Résistance Nominale Ω	Température °C	Résistance Nominale Ω
- 40	209603	40	5774	120	578,1
- 35	158088	45	4856	125	514,6
- 30	120372	50	4103	130	459,4
- 25	92484	55	3482	135	411,1
- 20	71668	60	2967	140	368,8
- 15	55993	65	2539	145	331,6
- 10	44087	70	2182	150	298,9
- 5	34971	75	1881,6	155	270
0	27936	80	1628,8	160	244,4
5	22468	85	1415	165	221,7
10	18187	90	1233,5	170	201,6
15	14813	95	1078,8	175	183,6
20	12136	100	946,6	180	167,6
25	10000	105	833,1	185	153,3
30	8284	110	735,5	190	140,4
35	6899	115	651,1	195	128,9
40	5774	120	578,1	200	118,5

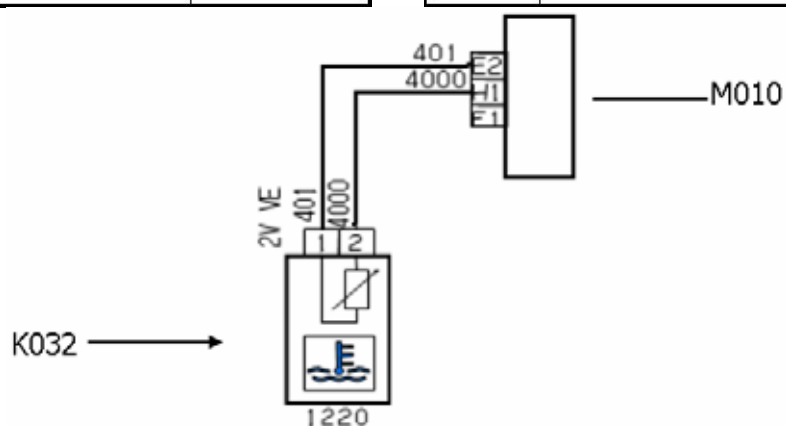


Engine temperature sensor

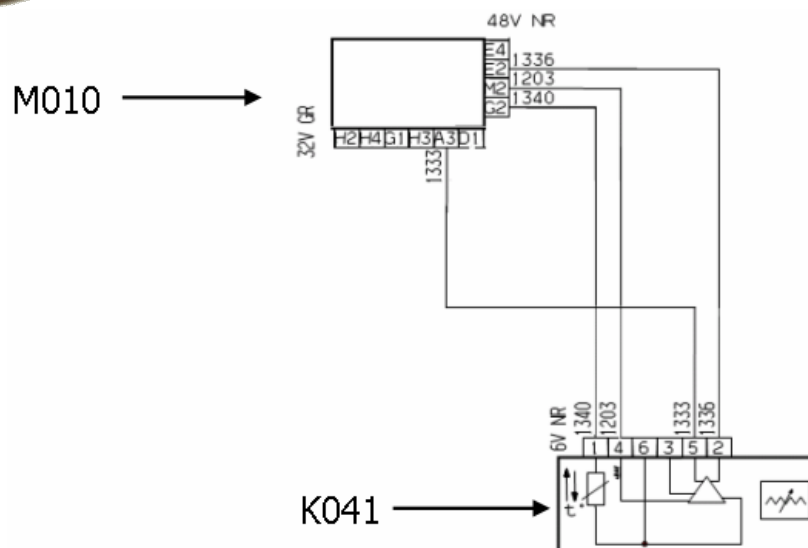
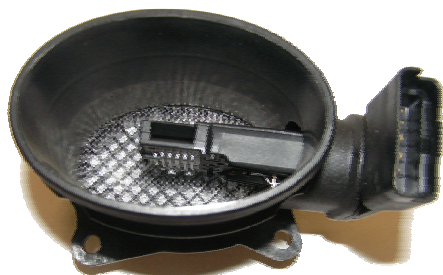


T° in °C	Valori della resistenza	± T°
-30	88500 Ω	0.97
-25	65200 Ω	0.97
-20	48535 Ω	0.97
-15	36475 Ω	0.97
-10	27665 Ω	0.97
-5	21160 Ω	0.97
0	16325 Ω	0.73
5	12695 Ω	0.73
10	9950 Ω	0.73
15	7855 Ω	0.73
20	6245 Ω	0.73
25	5000 Ω	0.57
30	4028.5 Ω	0.57

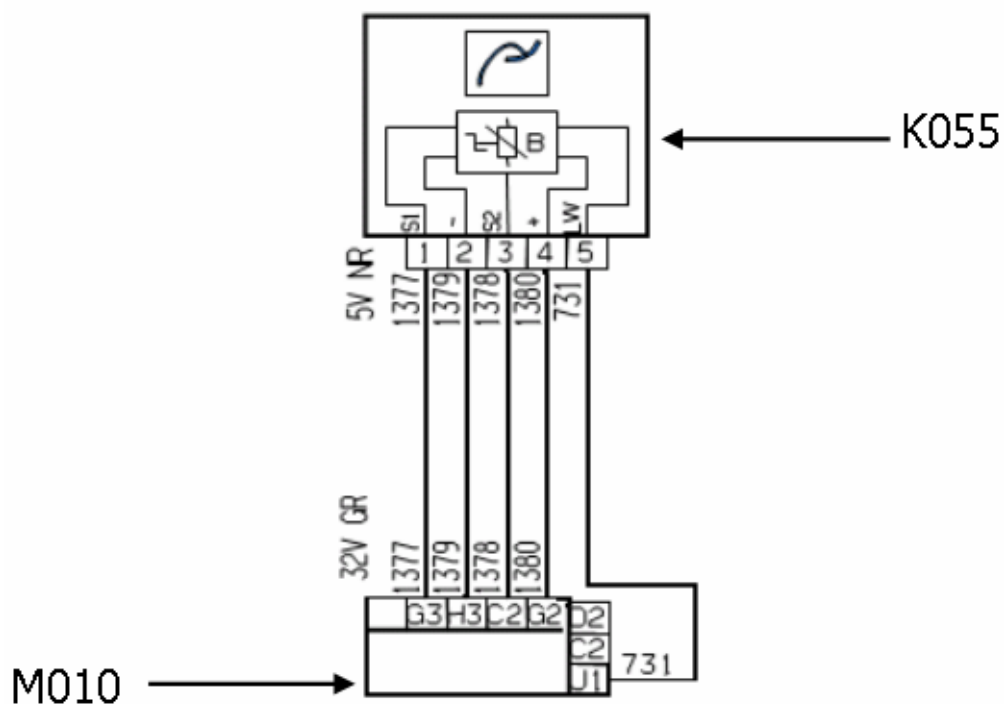
T° in °C	Valori della resistenza	± T°
35	3266 Ω	0.57
40	2666.5 Ω	0.57
45	2184.5 Ω	0.57
50	1801.5 Ω	0.57
55	1493 Ω	0.57
60	1244 Ω	0.57
70	876 Ω	0.57
80	629 Ω	0.34
90	458.85 Ω	0.34
100	340 Ω	0.30
110	255.6 Ω	0.30
120	194.625 Ω	0.30
130	150.45 Ω	0.70



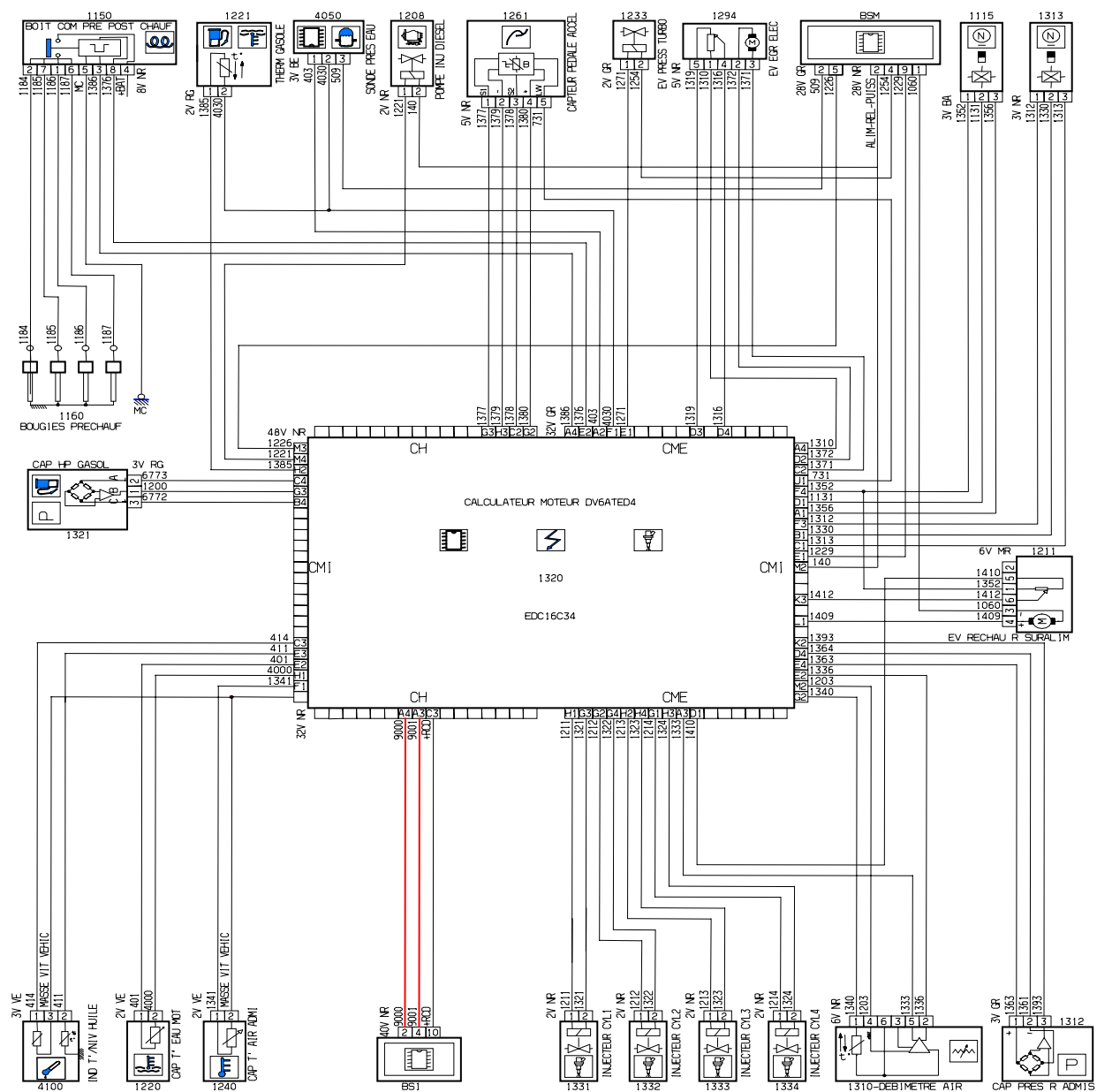
Air flow meter with incorporated air temperature sensor



Accelerator pedal potentiometer



BOSCH EDC16C34 Engine management wiring diagram



3.2 2.0 MULTIJET 120CV ENGINE (DW10UTED4)

General information on the PCR system

The Common Rail system is the only diesel system in which there is no direct angular dependence between the crankshaft and the generation of high pressure.

The SIEMENS Piezo Common Rail (PCR) diesel injection system is a latest generation Common Rail injection system that uses injectors controlled by an electric Piezo actuator.

It is composed of the diesel Common Rail pump, high pressure pipe supply line and injectors controlled by piezo actuators

The diesel Common Rail pump comprises:

- volumetric control solenoid valve (VCV),
- fuel internal transfer pump (ITP)
- high pressure pump (HPP)
- pressure control solenoid valve (PCV).

The conception of the diesel Common Rail pump permits rejecting the fuel as needed and therefore increasing the efficiency of the diesel engine.

The fuel internal transfer pump (ITP) draws the diesel fuel from the tank and drives it into the volumetric control solenoid valve (VCV). This regulated the quantity of fuel feeding the high pressure pump (HPP).

The fuel internal transfer pump and the high pressure pump are driven directly by the engine. The high pressure pump drives the fuel into the supply line (bar) with a pressure that can go up to 1500 bar.

The high pressure pipes connecting the rail to the injectors.

The Piezo injectors permit very short command times and permit freely choosing the start and the injected quantity according to the data required by the engine control unit (ecu)

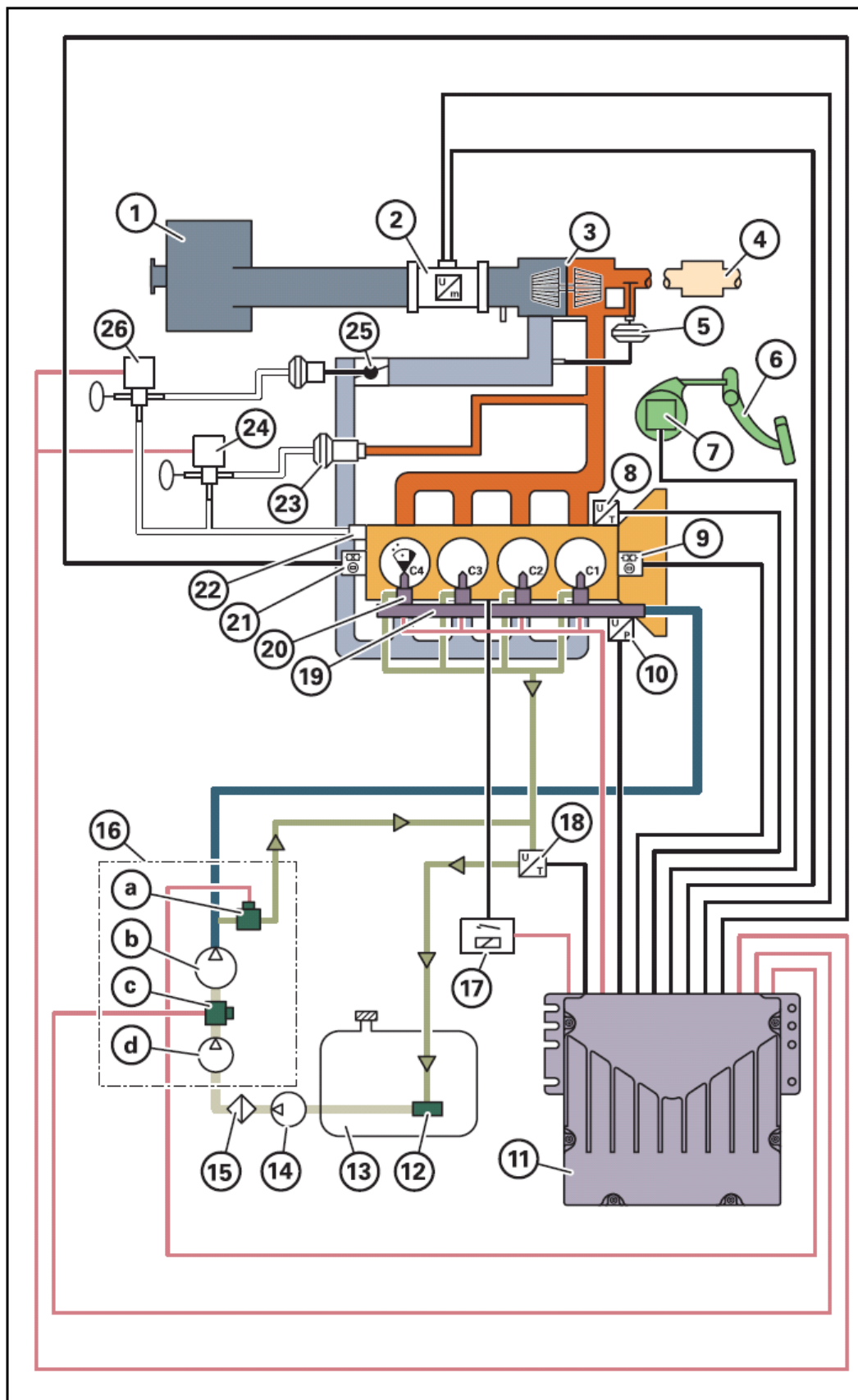
The system pressure generated by the diesel Common Rail pump is optimally adjusted to every kind of operation, irrespective of the engine speed.

Because of the reserve volume in the rail the injection pressure remains virtually constant throughout the injection process.

The system authorizes pre-injection and main injection.

Pre-injection decreases the combustion noise level and, in many cases, reduces the emission of exhaust gas.





Key

- 1 air filter
- 2 air flow meter with intake air temperature sensor
- 3 turbocharger
- 4 catalyst
- 5 overpressure valve (Wastegate)
- 6 accelerator pedal
- 7 accelerator pedal sensor
- 8 coolant temperature sensor
- 9 crankshaft position sensor
- 10 high fuel pressure sensor
- 11 engine control unit (ecu)
- 12 fuel level sensor
- 13 fuel tank
- 14 starter hand pump
- 15 diesel fuel filter
- 16 diesel Common Rail pump with
 - a pressure control solenoid valve (PCV)
 - b high pressure pump (HPP) outlet
 - c volumetric control solenoid valve (VCV)
 - d fuel internal transfer pump (ITP)
- 17 pre-heating relay
- 18 fuel temperature sensor
- 19 rail
- 20 injector
- 21 camshaft position sensor
- 22 vacuum pump
- 23 exhaust gas recycling valve (EGR)
- 24 vacuum control solenoid valve (EPW) of the EGR
- 25 motorized air throttle valve
- 26 vacuum throttle control solenoid valve (EPW)
- C1 cylinder 1
- C2 cylinder 2
- C3 cylinder 3
- C4 cylinder 4



Diesel Common Rail pump

D Diesel

C Common Rail

P Pump

The diesel Common Rail pump is composed of elements that are all incorporated in a single casing

Fuel internal transfer pump ITP

I Internal

T Transfer

P Pump

The fuel internal transfer pump is a rotary vane pump that draws fuel from the tank through the fuel filter and supplies the high pressure pump.

Volumetric control solenoid valve VCV

V Volumetric

C control

V solenoid valve

The volumetric control solenoid valve controls the transfer of fuel into the high pressure part of the pump and thereby permits supplying it as it requires.

High pressure pump HPP

H high

P pressure

P pump

The high pressure pump is a radial pump with 3 pistons and supplies the rail with the pressure necessary for system injection.

Pressure control solenoid valve PCV

P pressure

C control

V solenoid valve

The pressure control solenoid valve controls the outlet pressure of the high pressure pump.



Volume of the high pressure side

- high pressure pipe to the supply rail
- rail
- 4 high pressure pipes connected to the injectors
- high pressure sensor.

Piezo Injectors

The Piezo injectors permit very fast and exact metering of the quantity of fuel.

The Piezo injector opening and closing times are four times faster than with conventional systems, permitting short and variable intervals between pre-injection and main injection.

Following table key:

1 diesel Common Rail pump:

a high pressure pump (HPP)

b fuel internal transfer pump (ITP)

c volumetric control solenoid valve (VCV)

d pressure control solenoid valve (PCV)

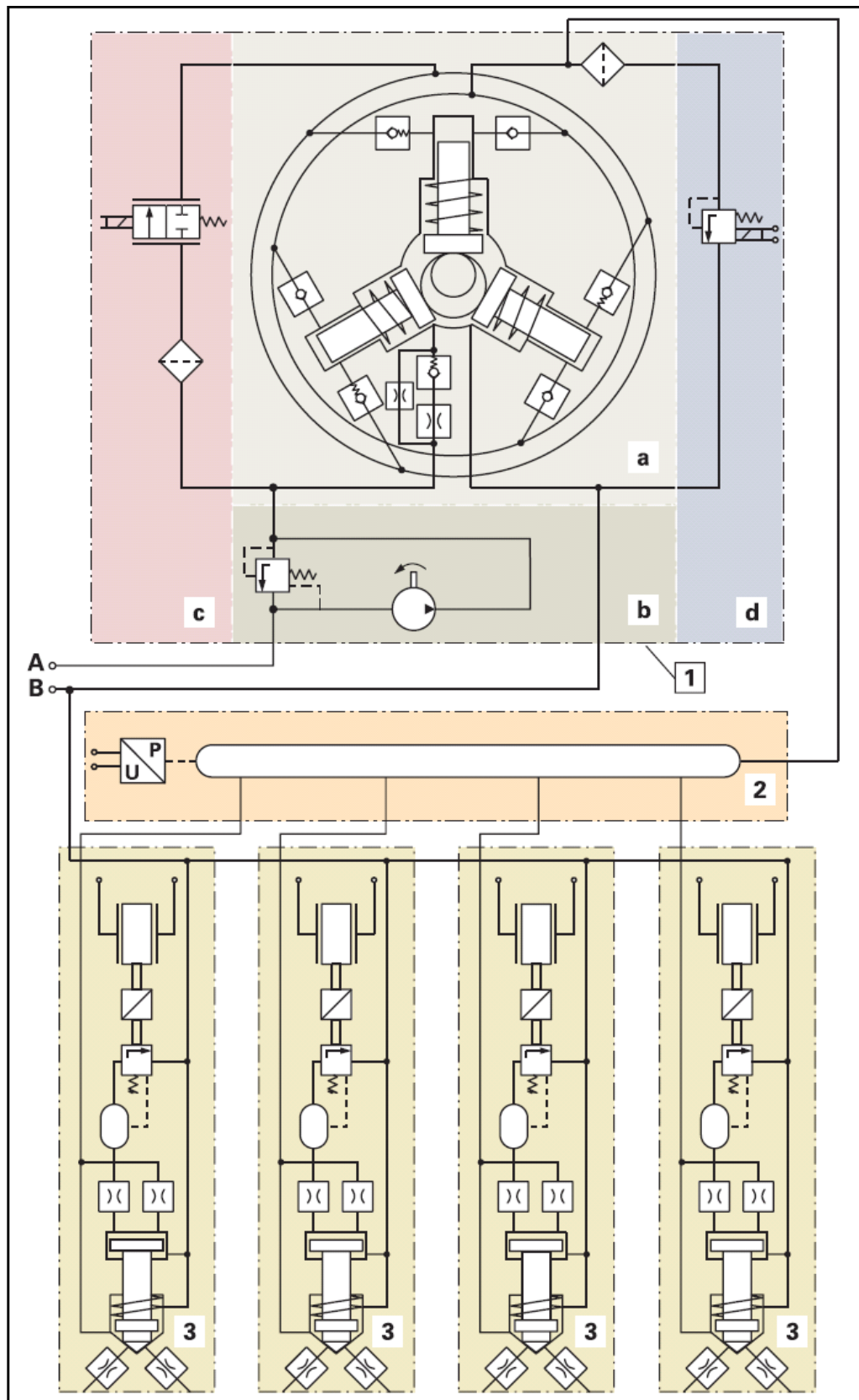
2 supply rail with high pressure sensor

3 injectors

A fuel in

B fuel return





injectors

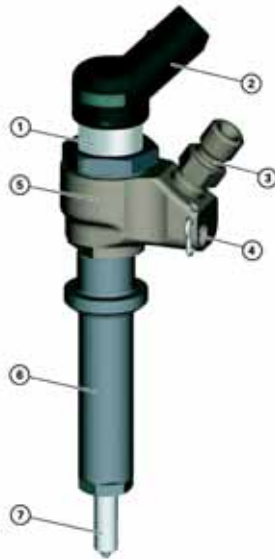
The Piezo injectors connected to the rail inject the fuel necessary for the various types of engine operation into the combustion chambers.

The injection quantity per engine cycle is composed of a pre-injection quantity and a main injection quantity. This division provides "smooth" combustion for the diesel engine.

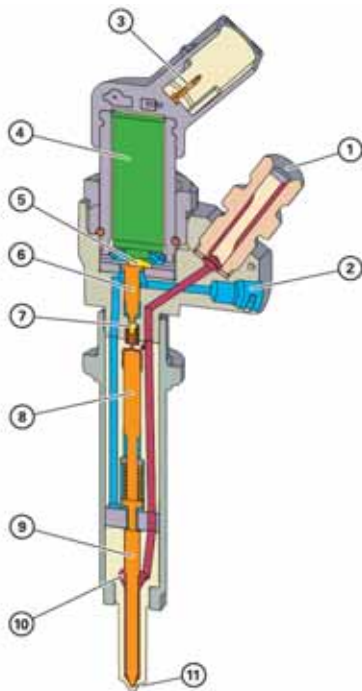
The opening and closing times are very short thanks to the Piezoelectric control.

The injected amount of fuel can therefore be controlled and proportioned very precisely.

The injectors are controlled by the engine control unit (ecu).



- 1 Piezo actuator
- 2 electric connector
- 3 high pressure connector
- 4 fuel return
- 5 injector head
- 6 injector stem
- 7 injector



- 1 high pressure connector
- 2 fuel return
- 3 connector connected to the engine control unit (ecu)
- 4 Piezo actuator
- 5 mechanical amplifier lever
- 6 opening control piston
- 7 closing mushroom head
- 8 needle control piston
- 9 injector needle
- 10 high pressure chamber
- 11 injector orifices (5)



Operation

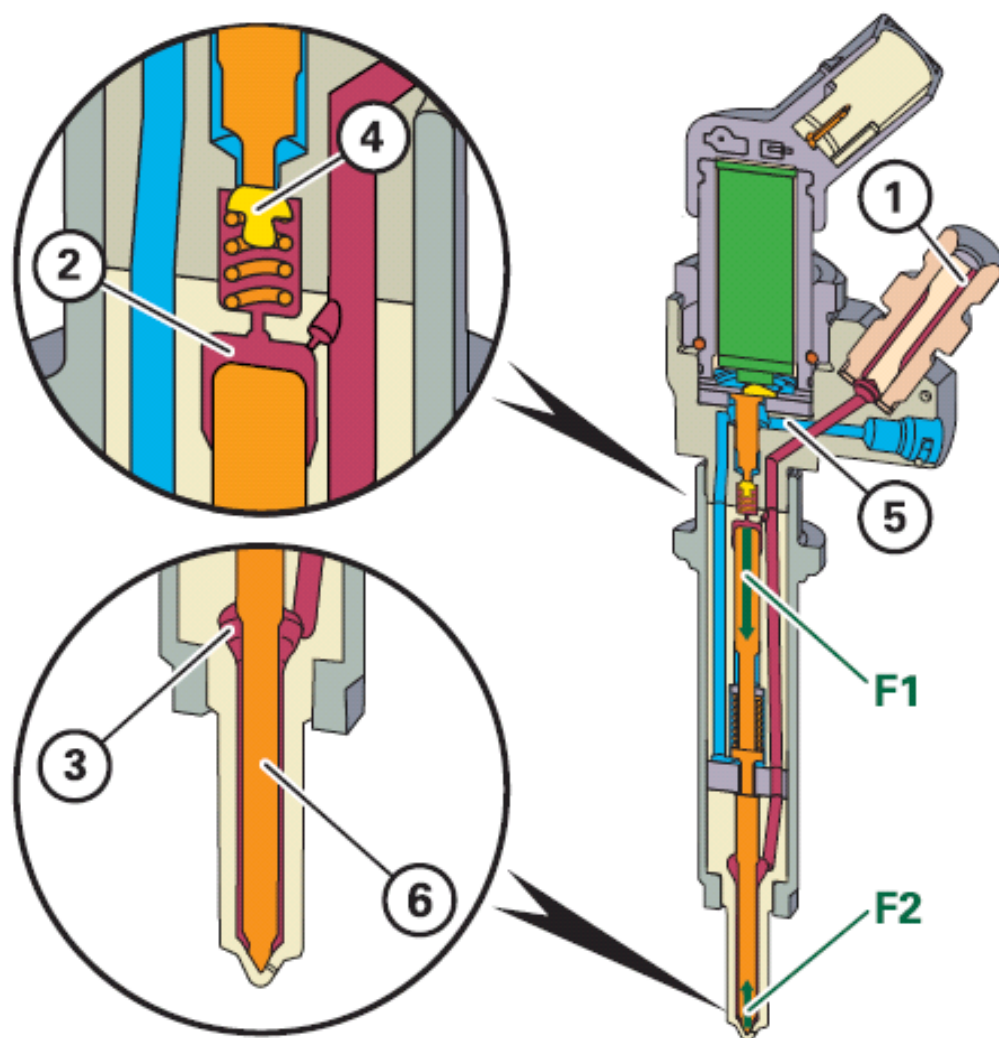
- Injector not controlled:

The high pressure of the fuel from the rail comes through the high pressure supply line (1) into the control chamber (2) and into the high pressure chamber (3) of the nozzle.

The fuel return opening (5) is closed by a mushroom head spring (4).

The hydraulic force (F_1) applied by the high pressure of the fuel on the needle control piston (6) in the control chamber (2) is stronger than the hydraulic force (F_2) applied at the tip of the needle since the surface area of the control piston of the needle in the control chamber is greater than the surface area of the tip of the needle.

The nozzle orifice is closed.

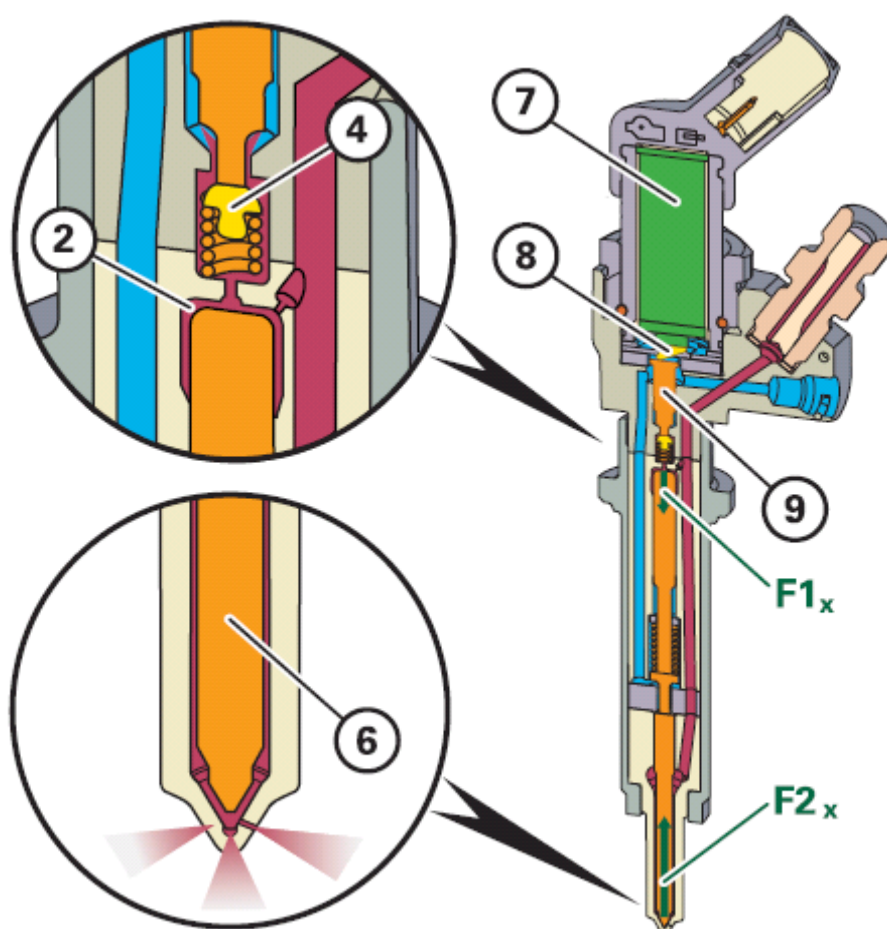


Injector controlled:

The Piezo actuator (7) acts in cascade on the amplifier lever (8), on the opening piston (9) and on the closing mushroom head (4) that on opening sets the control chamber (2) in communication with the fuel return.

There is a drop in pressure in the control chamber and the hydraulic force (F_{2x}) applied at the orifice of the needle is greater than the force (F_{1x}) on the needle control piston in the control chamber.

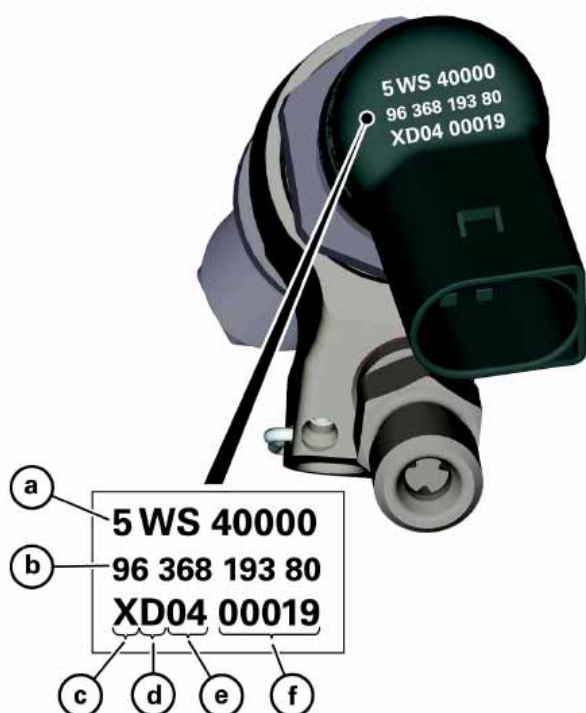
The injector needle (6) rises and the fuel enters the combustion chamber through the 5 nozzle orifices.



With the engine stationary, the valve connecting the control chamber to the fuel return and the injector needle is closed by the force of the two springs.

A small quantity of fuel is carried by the high pressure directly into the fuel return to lubricate the contact between the injector needle and the needle guide.

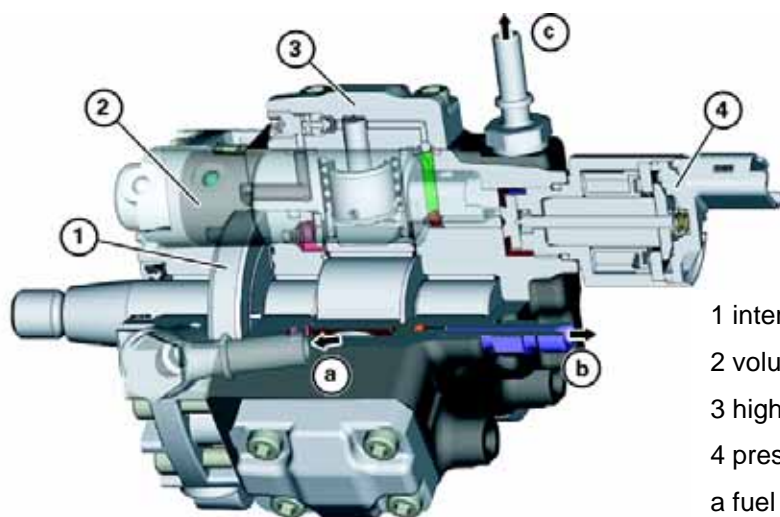




Common Rail pump

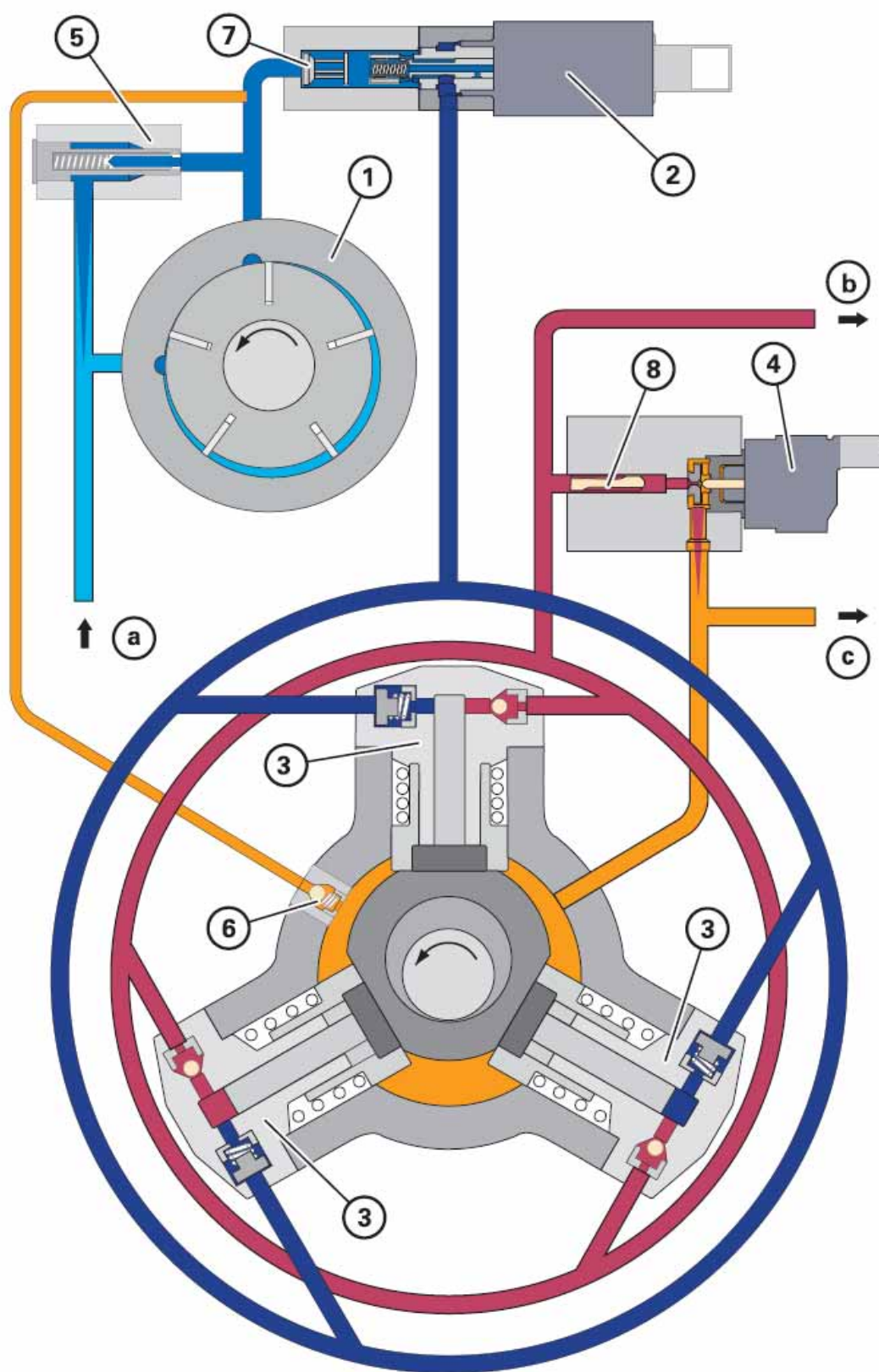
The variable high pressure diesel Common Rail pump is a radial piston pump designed for supply adapting to need. It has three pumping units that are intervalled by an angle of 120°.

The diesel Common Rail pump generates high fuel pressure in the rail and thereby supplies the injectors with the necessary amount of fuel for the types of engine operation



- 1 internal transfer pump ITP
- 2 volumetric control solenoid valve VCV
- 3 high pressure pumping unit
- 4 pressure control solenoid valve PCV
- a fuel in
- b high pressure connection
- c fuel return





Functional diagram of the diesel Common Rail pump

- 1 fuel internal transfer pump ITP
- 2 volumetric control solenoid valve VCV
- 3 pumping element of the high pressure part
- 4 pressure control solenoid valve PCV
- 5 overpressure valve
- 6 spring lubrication valve
- 7 filter-sieves
- 8 disc filter
- a fuel in
- b high pressure connection
- c fuel return



Fuel route in the diesel Common Rail pump (DCP)

The fuel internal transfer pump ITP (1) draws diesel from the tank through the fuel filter. The fuel is afterwards driven towards the lubrication valve (6) and towards the volumetric control solenoid valve VCV (21)

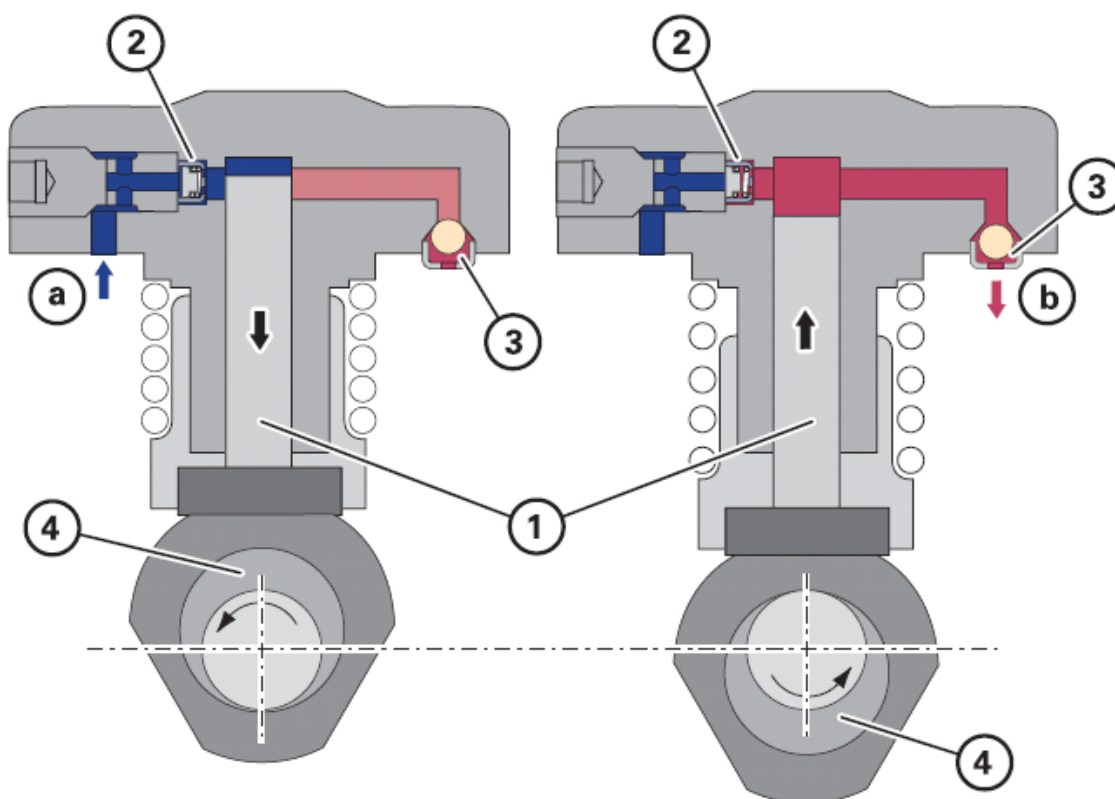
The overpressure valve (5), parallel to the fuel internal transfer pump, opens when the volumetric control solenoid valve is closed and directs the fuel towards the fuel transfer pump.

The fuel reaches the interior of the pump via the lubrication valve (6) and from there goes to the fuel return (C).

The volumetric control solenoid valve, governed by the engine control unit, determines the quantity of fuel that supplies the elements of the HPP (3).

The high pressure outlets of the three pumping elements are gathered in a pipe and towards the high pressure outlet (b) of the diesel Common Rail pump DCP.

Between the high pressure line and the fuel return there is the pressure control solenoid valve (4) that governs the quantity of fuel that goes towards the high pressure outlet and in this way the fuel pressure in the rail



Operation of the high pressure elements

• fuel intake:

When the piston (1) moves down it creates a vacuum in the pump cylinder that opens the inlet valve (2) overcoming the strength of the spring. The fuel (a) coming from the volumetric control solenoid valve is drawn in.

At the same time, the exhaust valve (3) closes due to the difference in pressure between the pump cylinder and the pressure of the fuel in the circular gallery.

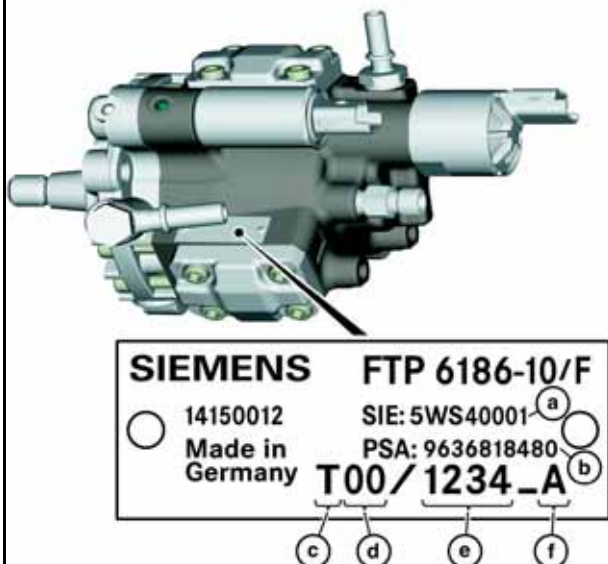
• fuel removal:

The cam (4) pushes the piston (1) upwards, the inlet valve (2) closes pushed by the strength of the spring and the increasing pressure in the pumping cylinder.

The exhaust valve (3) opens when the pressure in the pumping cylinder is greater than the pressure of the fuel in the circular gallery (b).



Marking of the diesel Common Rail pump (DCP)



a manufacturer code number

b PSA spare parts No.

c year of production

T: 2000

U: 2001

V: 2002

W: 2003

X: 2004

LÀ: 2005

Z: 2006

d week

e pump no. in the week's production

f end series control no.

Volumetric control solenoid valve VCV

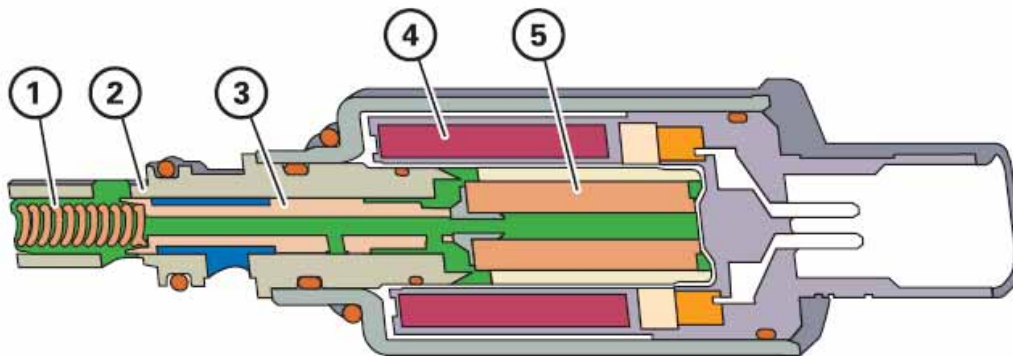
The volumetric control solenoid valve VCV regulates the entry of fuel that goes from the fuel internal transfer pump, incorporated in the diesel Common Rail pump DCP, towards the high pressure pumping elements.

This permits drawing in only the amount of fuel needed by the engine.

The power consumption of the high pressure pump is reduced and engine efficiency is increased.

The volumetric control solenoid valve VCV is fitted sideways, directly on the diesel Common Rail pump DCP.



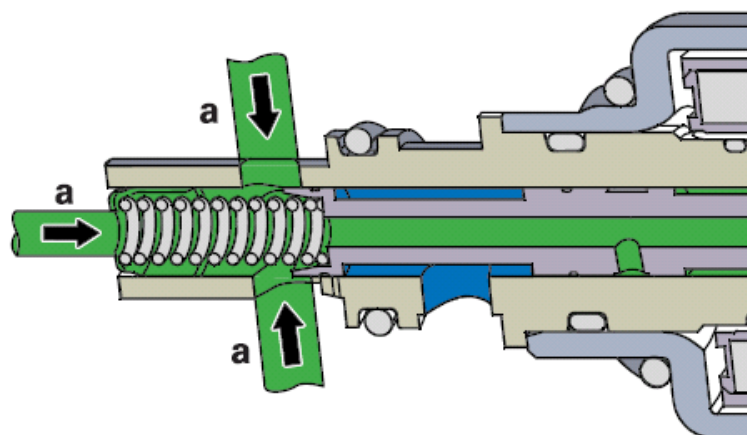


- 1 return spring
- 2 cylinder
- 3 piston
- 4 control coil
- 5 control pin

Operation of the volumetric control solenoid valve VCV

- volumetric control solenoid valve VCV not controlled:

The piston not controlled electrically blocks the passage of diesel into the high pressure pump. The piston is held by the pressure of the return spring

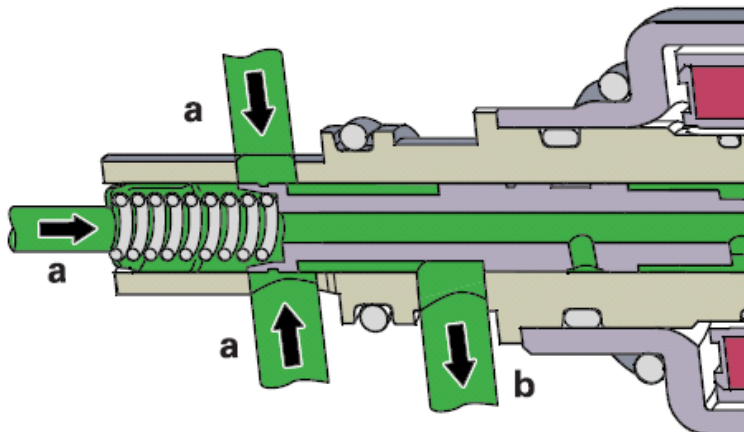


a) fuel supply from the internal transfer pump ITP

volumetric control solenoid valve VCV controlled:

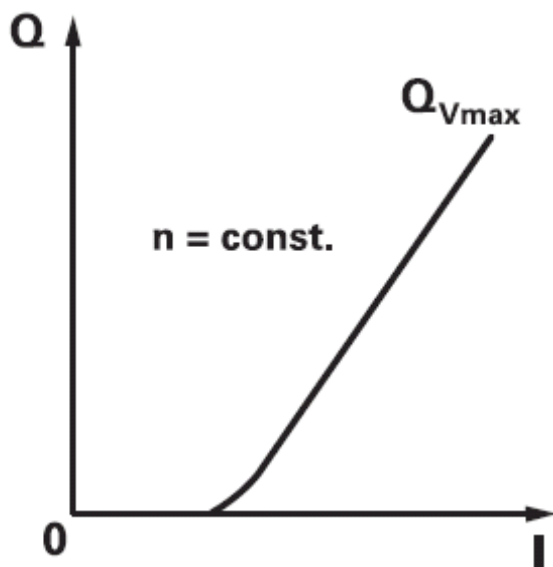
The force of the control coil is proportional to the electric current that acts against the return spring

In this way the opening between the two connections is proportional to the electric current



a) fuel supply from the internal transfer pump ITP

b) quantity of fuel going to the high pressure pump HPP



Characteristic curve of the volumetric control solenoid valve VCV

Q) flow of fuel volume

I) control current

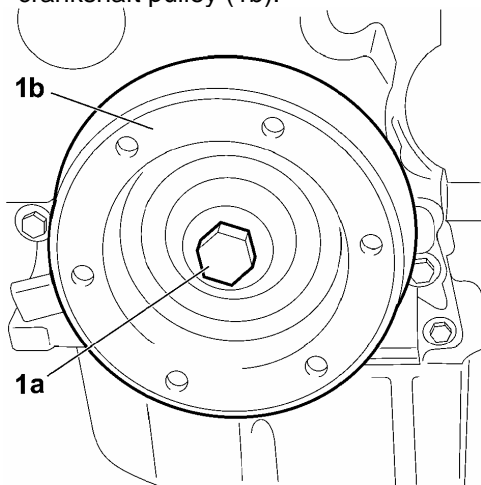


3.3 TIMING BELT

3.3.1 Removal

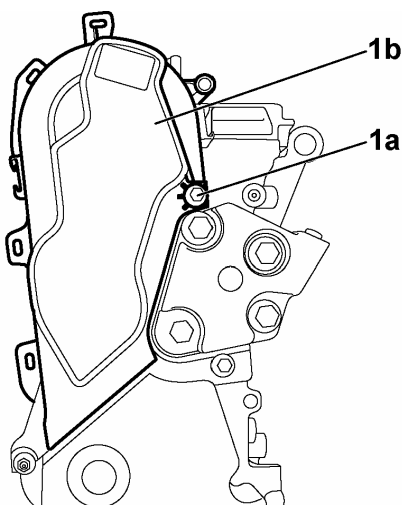
- Remove the subsidiary member drive belt.
- Lock the engine flywheel with the specific tool 1.860.846.000.

1. Unscrew the screw (1a) and remove the crankshaft pulley (1b).

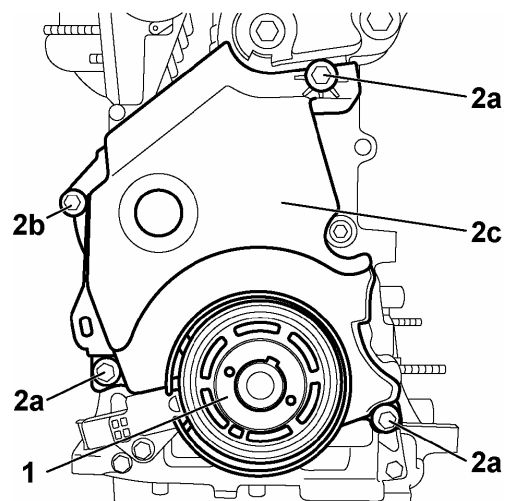


- Remove the tool for locking the engine flywheel.

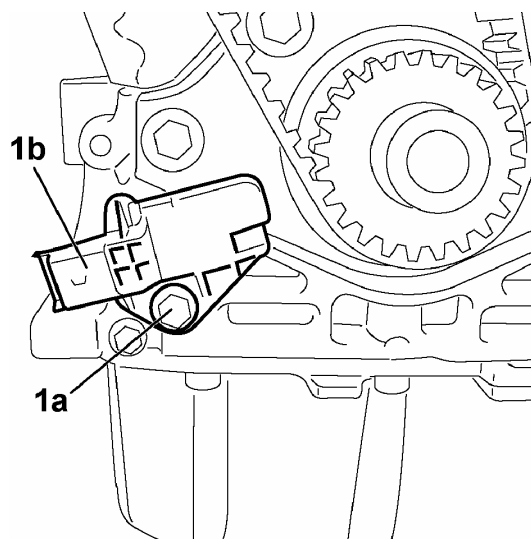
1. Unscrew the screw (1a) and take the top cover off the timing system (1b).



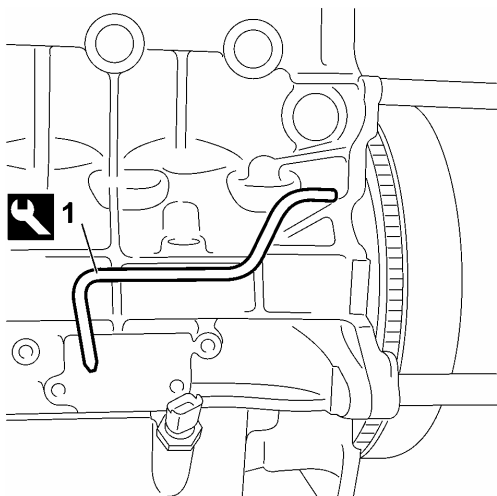
1. Remove the phonic wheel from the crankshaft.
2. Unscrew the screws (2a) and the nut (2b), take the bottom cover off the timing system (2c).



1. Unscrew the screw (1a) and remove the rpm sensor (1b).

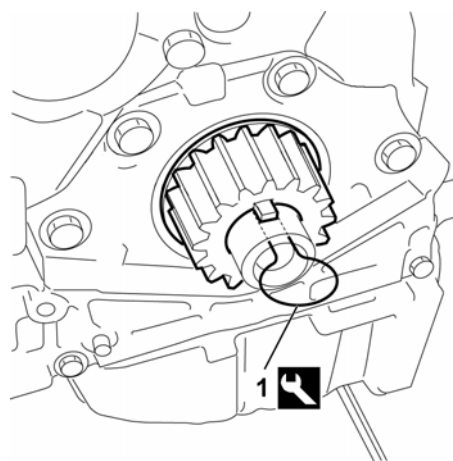


1. Position the crankshaft in phase locking it with the specific tool **1.860.863.000**.



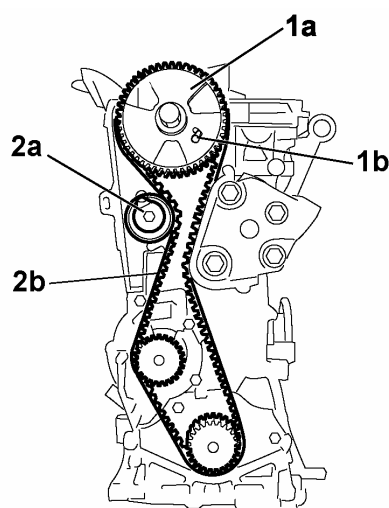
3.3.2 Assembly

1. Centre the driving toothed pulley with the specific tool **2.000.020.300**.

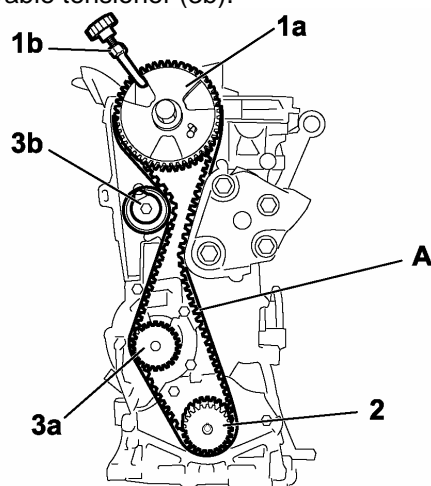


- Lock the engine flywheel with the specific tool **1.860.846.000**.

1. Lock the driven toothed pulley (1a) with an 8 mm calibrated pin (1b).
2. Loosen the screw (2a) and remove the belt (2b).

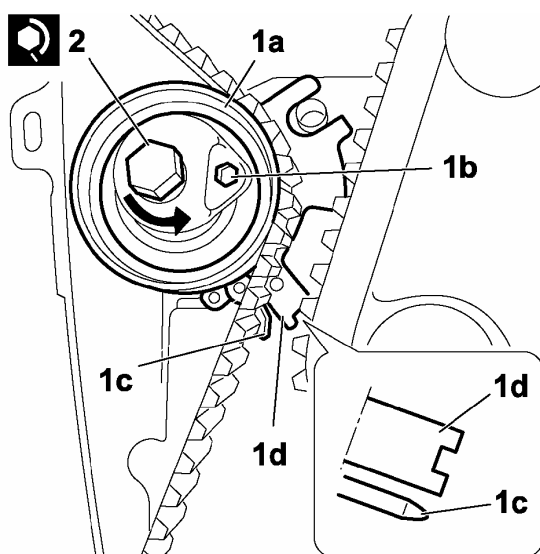


1. Fit the toothed belt on the driven pulley (1a) and lock it with a clamp (1b).
2. Tension the side "A" of the belt and fit it onto the driving pulley.
3. Keeping the belt taut, fit it onto the pulley driving the coolant pump (3a) then onto the movable tensioner (3b).

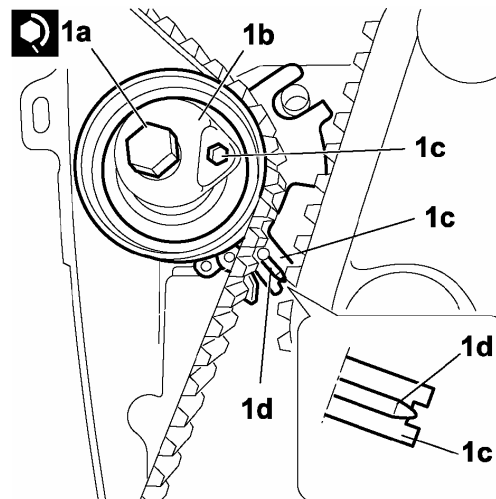


- Remove the clamp from the driven toothed pulley.
- Remove the centring tool of the driving toothed pulley.

1. Turn the movable tensioner (1a) anticlockwise by using a suitable hex wrench on the impression (1b) until the pointer (1c) exceeds the reference mark (1d).
2. Tighten the screw fastening the movable tensioner to the prescribed torque.

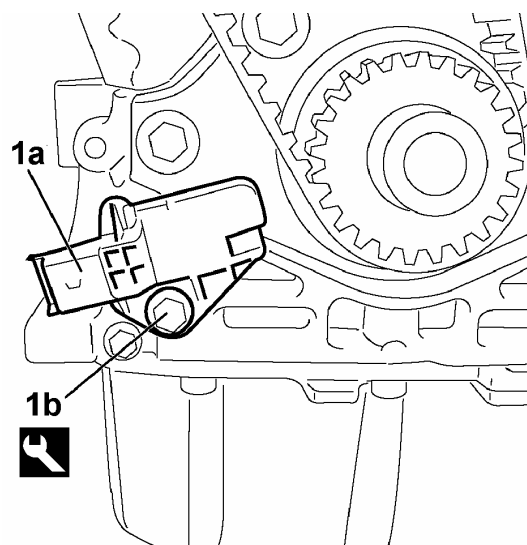


1. Unscrew the screw (1a), turn the movable tensioner (1b) anticlockwise by using a suitable hex wrench on the impression (1c) until the pointer (1d) is positioned on the reference mark (1e). Tighten the screw (1a) fastening the movable tensioner to the prescribed torque.



- Turn the crankshaft 2 turns in the direction of rotation of the engine and check that the pointer of the movable tensioner has not moved; if it has then do the belt tensioning again.

1. Fit the engine rpm sensor (1a) into place and tighten the screw (1b) to the prescribed torque.



- Remove the calibrated pin locking the driven toothed pulley.
- Remove the tool for the timing of the crankshaft **1.860.863.000**.

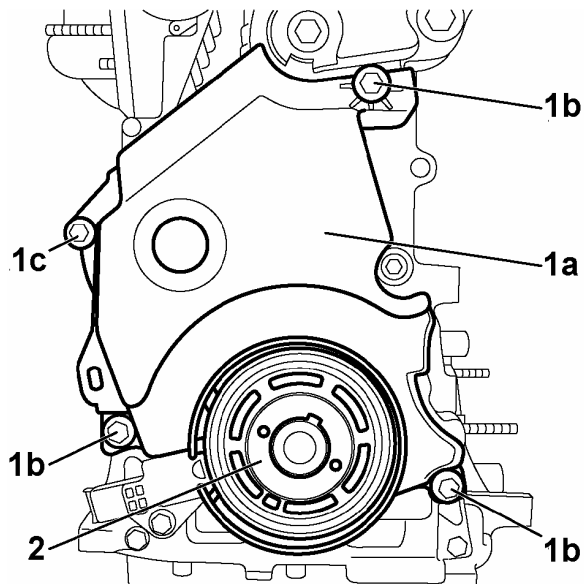
- Remove the tool for locking the engine flywheel **1.860.846.000**.

- Turn the crankshaft 10 turns in the direction of rotation of the engine.

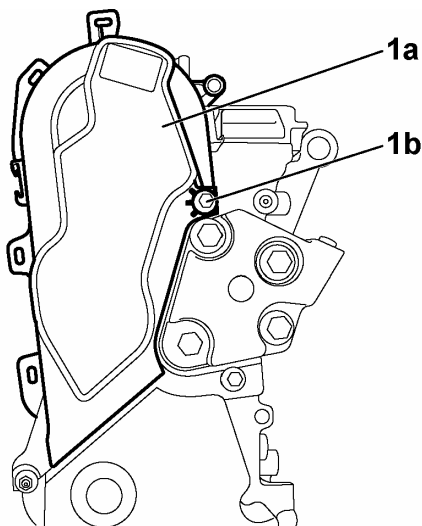


1. Fit the bottom cover of the timing system (1a) into place and screw on the screws (1b) and the nut (1c).

2. Fit the phonic wheel into place on the crankshaft.

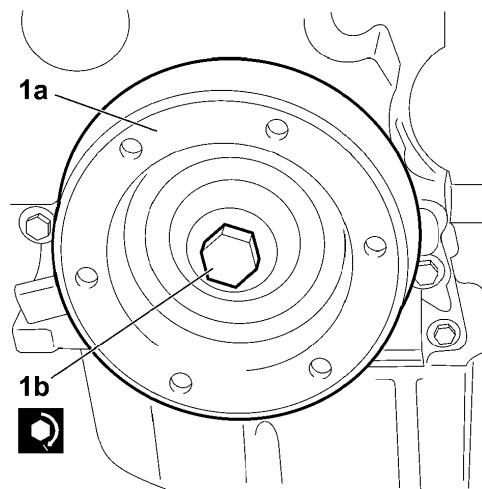


1. Fit the top cover of the timing system (1a) and screw in the screw (1b).



Lock the engine flywheel with the specific tool 1.860.846.000.

1. Fit the auxiliary member belt drive pulley (1a) into place, spread a specific thread-locking product onto the thread of the pulley retaining screw, and tighten the screw (1b) to the prescribed torque.



- Remove the tool for locking the engine flywheel 1.860.846.000.

- Fit on the subsidiary member drive belt.



Tools for 2.0 MULTIJET engine overhaul

Designation	Code	Function
Counter-torque	1,860,846,000	Flywheel locking
Bracket	1,871,001,000	Engine support
Clutch centre	2,000,020,600	Centre the clutch
Clutch kit	1,871,003,100	Pressure plate compression
Extractor	2,000,020,200	Electro-injector extraction
Counter-torque	1,860,964,000	Disassembly/Assembly driven toothed pulley
Grip	1,860,831,000	Disassembly/Assembly driven toothed pulley
Blade	1,870,718,000	Cut sealant
Bracket	1,860,815,000	Crankshaft rotation
Goniometer	1,860,942,000	Tightening to angle
Piston ring tightening tape	1,860,700,000	Fitting pistons in the cylinders
Drift tool	1,860,855,000	Oil seal insertion
Dial gauge base	1,870,404,000	Piston stand-out measurement
Drift tool	1,870,821,000	Oil seal insertion
Grip	1,860,831,000	Disassembly/Assembly driven toothed pulley
Drift tool	1,860,806,000	Corteco insertion on crankshaft flywheel side
Engine flywheel kit	2,000,020,700	Engine flywheel centring
Flywheel locking tool	1,860,863,000	Crankshaft timing
Template	2,000,020,300	Driving toothed pulley centring



Pliers	1,881,138,000	Removal/insertion of rings
Bracket	1,860,470,000	Cylinder head support
Wrench	2,000,003,100	Removal/tightening heater plugs
Valve retaining base	1,860,804,000	Valve retainer
Valve extraction lever	1,860,644,000	Valve spring-pressing lever
Cage	1,870,881,000	Compress valve spring
Pliers for valve oil seals	1,870,894,000	Valve guide oil seal extraction
Drift tool	2,000,020,800	Insert oil seals on valve seats
Cage	1,870,890,000	Compress valve spring



4. GEARBOX

4.1 BE4R (1.6 MULTIJET 90CV)

MANUAL GEARBOX (5 SPEED) WITH DIFFERENTIAL

DISMANTLING

- Place the gearbox on the rotary stand with the specific support.
- 1. Screw two retaining bolts (1a) onto the support (1b).



1. Unscrew the gearbox drain plug and remove.



1. Remove the reverse gear sensor.
2. Remove the gearbox air intake.



1. Unscrew the filler and level plug and remove.



1. Remove the drive shaft oil seal.



- Turn the stand.

- 1 Remove the drive shaft oil seal
2. Unscrew the retaining screws.
3. Remove the tachometer pinion assembly.



1. Remove the beat assembly.
2. Unfasten the outer part of the fork from the outside and remove it from the inside.



1. Unscrew the retaining screws.
- Cut the bead of sealant with the specific tool.
- **TOOL_ 1.870.718.000**
2. Remove the casing.



1. Remove the split pin retaining the fork.
- Engage 2nd gear.
- Engage another gear.
2. Remove the clip.
3. Unscrew the nut on the transmission shaft.
3. Unscrew the nut on the main shaft.



1. Using the extractor (1a) remove the retaining washer (1b). Protect the shaft with the plug (1c).

- **TOOL_** 1.845.028.000



1. Extract the synchronizer by hand.
2. Remove the fork, levering on the side of the rods.



1. Unscrew the retaining screw and remove it.
2. Remove the fork rod fastener.



1. Remove the hub assembly and the engine pinion.



1. Remove the spacer and the supporting bush.
2. Unscrew the transmission shaft rotation setscrews.
3. Unscrew the screw holding the shaft of the reverse gear.
4. Remove the segment (use two tapered bits and, if necessary, raise the shaft to help free it).
5. Unscrew the screws and nuts fastening the cover.



Remove the box cover (use a mallet to free the casing from the centring bushes).



1. Remove the oil vent.



1. Unscrew the retaining screws.
2. Remove the differential cover.



1. Remove the rod of the 5th gear.



1. Remove the differential assembly.



1. Free the fork rod and extract it upwards.



1. Remove the two centring pins.



1. Extract the pinion (1a) and the shaft (1b) of the reverse gear.
2. Remove the shafts with the forks.



1. Unscrew one screw from the outside.
2. Remove the reverse gear fork.



1. Extract the split pin of the idler rod.
2. Extract the idler rod.



1. Extract the idler fork.



1. Using a drift (1a), beat on the split pin (1b) of the selector taking care to have it come out into the specific seat and retrieve it.



1. Remove the selector rod.
2. Remove the spring assembly of the selector.
3. Remove the selector oil seal.



1. Unscrew the retaining screws.



1. Remove the idler rod gasket.



1. Renew the rear plug of the selector lever.



- Turn the stand.

1. Unscrew the retaining screws.
2. Remove the support of the main shaft.
3. Unscrew the pin of the bottom fork.



1. Remove and renew the plastic support of the transmission shaft.
2. Remove the main shaft bearings.



REASSEMBLY

- Fit the support of the main shaft in place in its seat.
- Tighten the retaining screws to the stated torque.
- Tighten the pin of the bottom fork to the stated torque.
- Fit a new idler rod gasket into place in its seat.
- Fit a new plastic support of the transmission shaft in place in its seat.
- Fit a new bearing of the main shaft in place in its seat.
- Fit the support of the selector in place in its seat.
- Tighten the retaining screws of the selector support to the stated torque.
- Fit the spring assembly of the selector in place in its seat.
- Fit the selector oil seal gasket in place in its seat.
- Fit the selector rod in place in its seat.
- Insert a new selector split pin.
- Fit the idler fork into place in its seat.
- Fit the idler rod into place in its seat.
- Insert the split pin of the idler rod.
- Fit the reverse gear fork into place in its seat.
- Tighten the screw of the reverse gear fork from the outside to the stated torque.
- Fit the shafts with the forks into place in their seat.
- Fit the pinion and the reverse gear shaft into place in their seat.
- Fit the two differential casing centring pins into place in their seat.
- Fit the differential internal box into place in its seat.
- Fit the differential casing into place in its seat and tighten the related retaining screws to the stated torque.
- Fit the fork rod into place in its seat.
- Fit the rod of the 5th gear into place in its seat.
- Fit the oil vent into place in its seat.
- Fit the box cover into place in its seat, centring it on the centring bushes.
- Tighten the retaining screws and nuts of the cover to the stated torque.
- Fit a new segment of the transmission shaft into place in its seat.
- Tighten the screw holding the reverse gear shaft to the stated torque.

- Tighten the transmission shaft rotation setscrews to the stated torque.
- Fit the spacer and the supporting bush into place in its seat.
- Fit the hub assembly and the engine pinion into place in its seat.
- Fit the fork rod fastener into place in its seat.
- Tighten the retaining screw and to the stated torque.
- Fit the fork into place in its seat.
- Fit the synchronizer into place in its seat.
- Fit a new retaining washer into place in its seat.
- Tighten the nut on the main shaft to the stated torque.
- Tighten the nut on the transmission shaft to the stated torque.
- Fit the clip into place in its seat.
- Engage the 3rd or 4th gear.
- Engage the 5th gear by hand.
- Fit a new fork retaining split pin into place in its seat.
- Apply a bead of sealant along the surface of contact of the gearbox.
- Fit the gearbox casing into place in its seat.
- Tighten the gearbox casing retaining screws to the stated torque.
- Fit the fork of the main shaft into place in its seat, working from the inside.
- Fit the beat assembly into place in its seat.
- Fit the tachometer pinion assembly into place in its seat.
- Tighten the retaining screws of the tachometer pinion to the stated torque.
- 1. Fit the axle output gaskets (1a) into place in their seat using the specific drift tool (1b).
- **TOOL** _ 1.870.426.000





- Turn the stand.

1. Fit the axle output gaskets (1a) into place in their seat using the specific drift tool (1b).

- **TOOL** _ 1.860.990.000 _ Drift tool _ Corteco insertion _ 1.6



- Tighten the filling and levelling plug to the stated torque.
- Tighten the gearbox drain plug to the stated torque.
- Fit the gearbox air intake into place in its seat.
- Fit the reverse gear sensor into place in its seat and tighten it to the stated torque.
- Support the gearbox with a hydraulic lift.
- Unscrew the fasteners and remove the gearbox with the differential from the supporting tool.
- **TOOL** _ 1.871.001.014 _ Support for 1.871.000.000 _ Support for fixing gearbox for dismantling - TiT
- Remove the supporting tool from the overhaul stand.
- **TOOL** _ 1.871.000.000 _ Rotary stand supporting gearbox _ Fixing gearbox for dismantling _ TiT
- Fit the gearbox with the differential in place on a suitable board.

Tools for 1.6 MULTIJET 90CV Gearbox overhaul

Designation	Code	Function
Adjuster for differential rolling	2000023600	
	Trade	
extractor	472/1-2 usag	extractor
extractor	472A/2 usag	extractor
extractor	454 N/1 usag	extractor

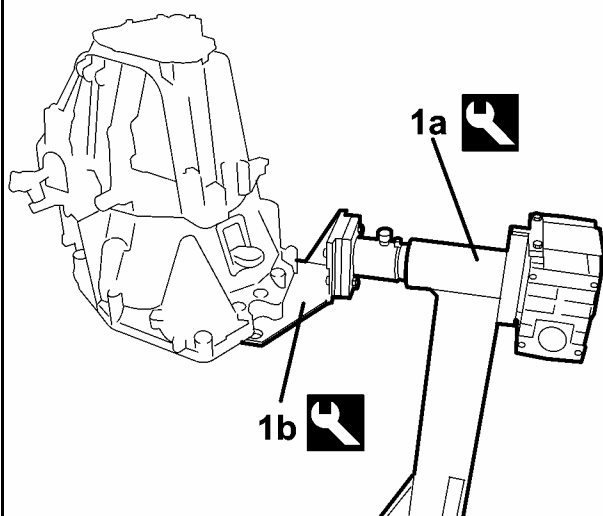


4.2 ML6C (2.0 MULTIJET)

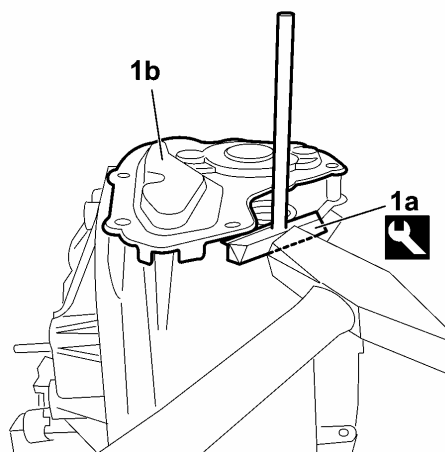
MANUAL GEARBOX (6 SPEED) WITH DIFFERENTIAL

Dismantling

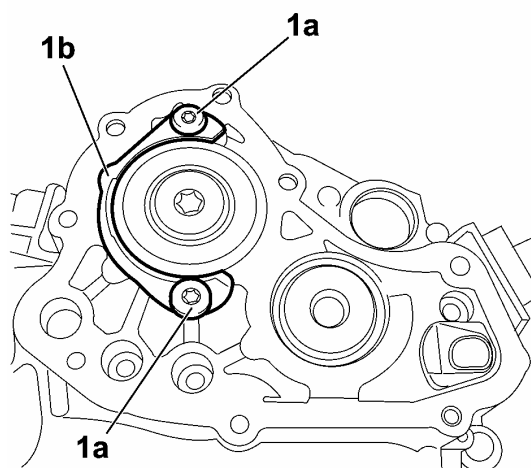
1. Place the gearbox on the rotary stand (1a) with the support (1b).



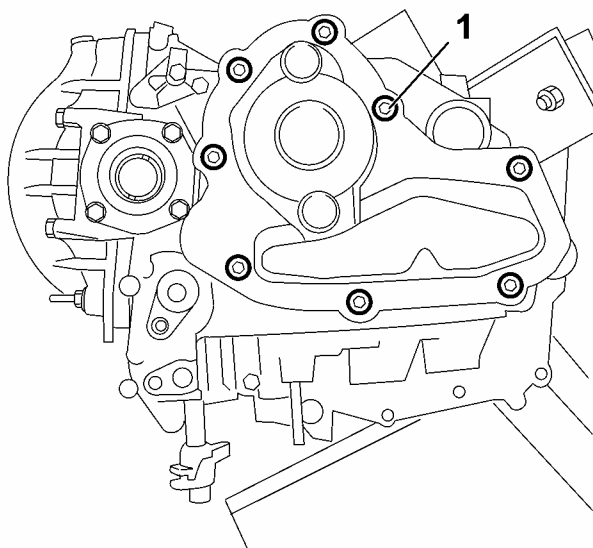
1. Cut the sealant with tool (1a) and remove the top cover (1b).



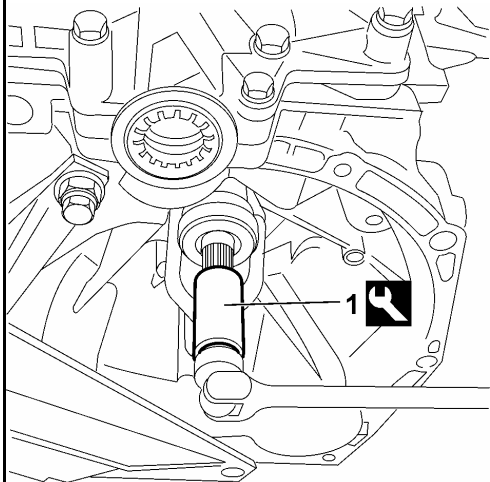
1. Unscrew the screws (1a) and remove the retaining flange (1b) of the transmission shaft.



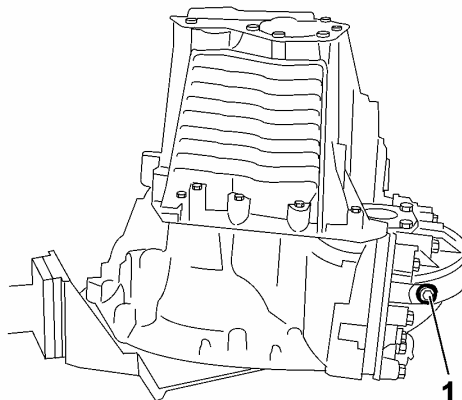
1. Unscrew the retaining screws.



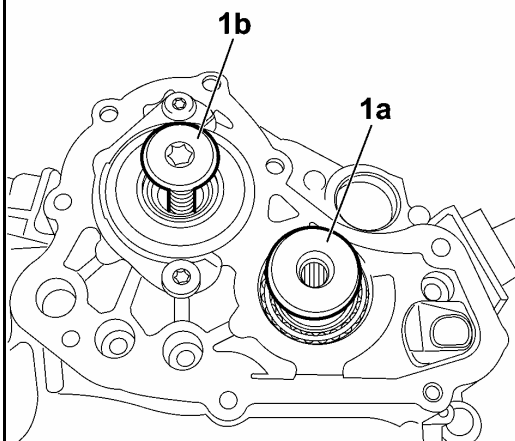
1. Engage a gear and keep the main shaft locked with the tool.



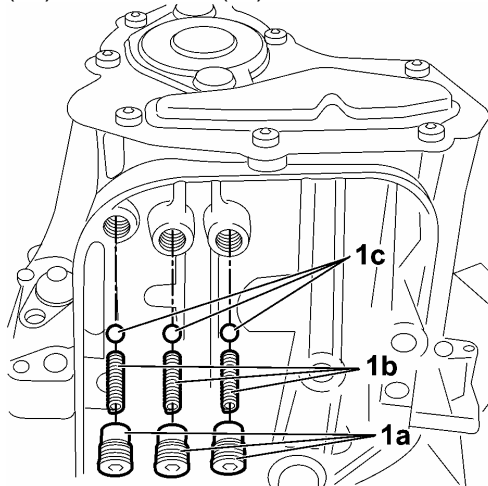
1. Remove the drain plug.



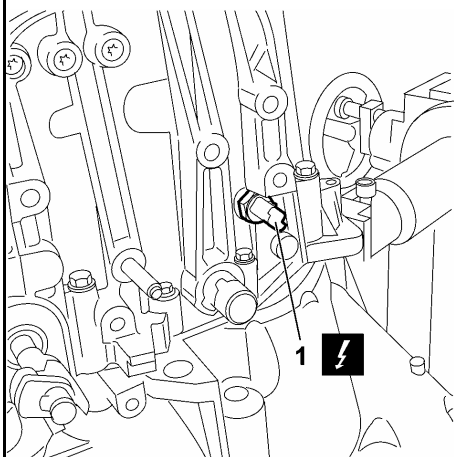
1. Unscrew the ring nut on the main shaft (1a) and the ring nut on the transmission shaft (1b), remove the tool.



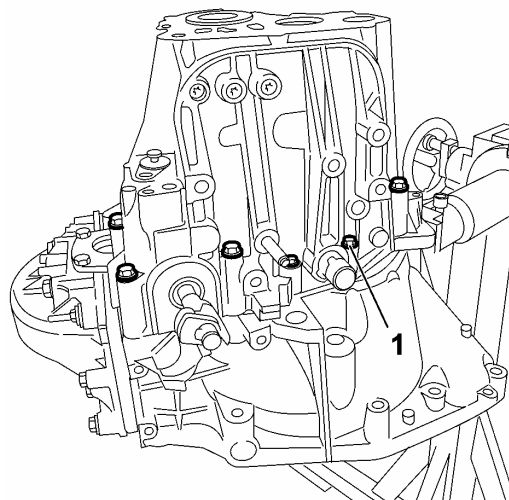
1. Unscrew the plugs (1a) and remove the springs (1b) and the balls (1c).



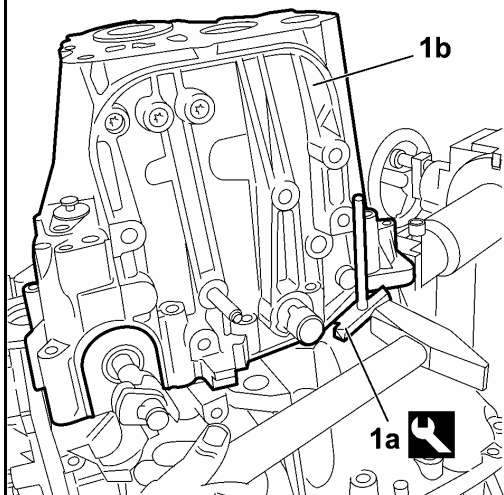
1. Unscrew and remove the reverse gear sensor.



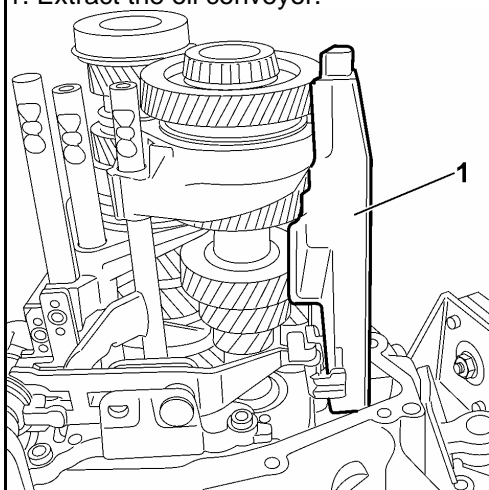
1. Unscrew the retaining screws of the gearbox gearing case.



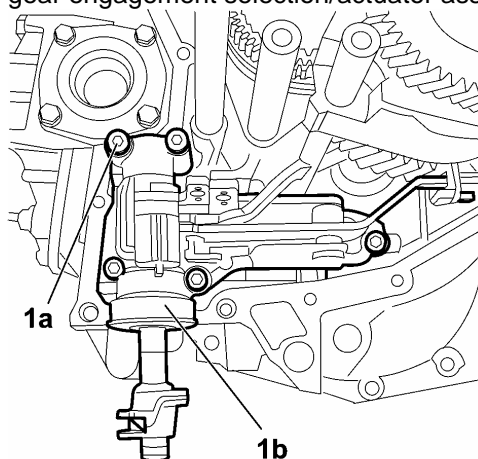
1. Cut the sealant with tool (1a) and remove the gearbox gearing case (1b).



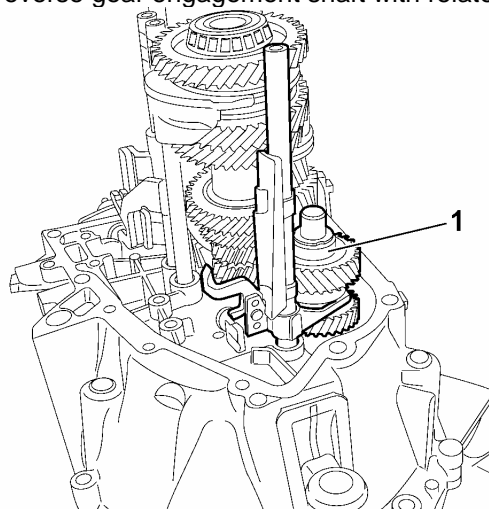
1. Extract the oil conveyor.



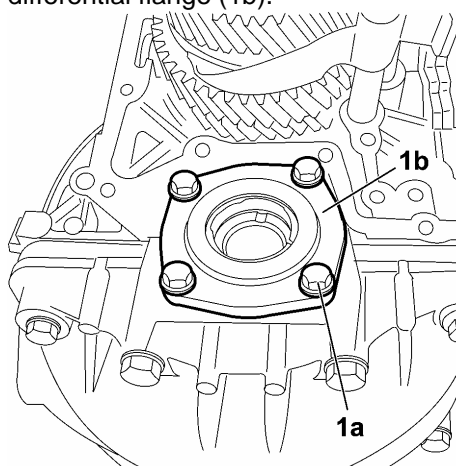
1. Unscrew the retaining screws (1a) and remove the gear engagement selection/actuator assembly (1b).



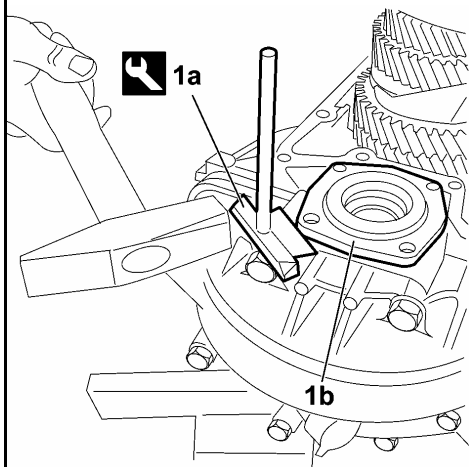
1. Remove the assembly of the selection fork rod and reverse gear engagement shaft with related gearing.



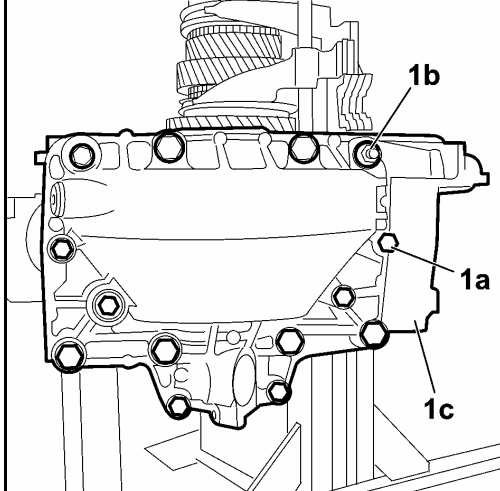
1. Unscrew the retaining screws (1a) of the differential flange (1b).



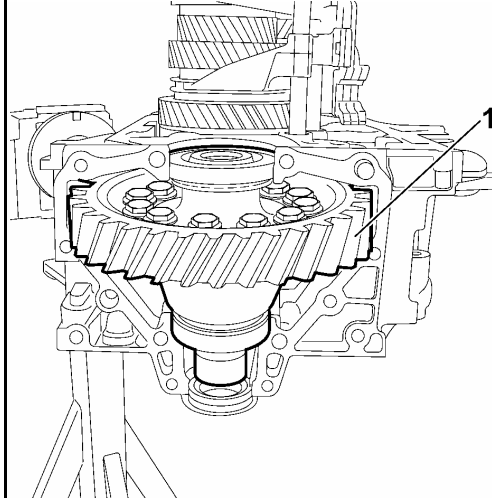
1. Cut the sealant with tool (1a) and remove the differential flange (1b).



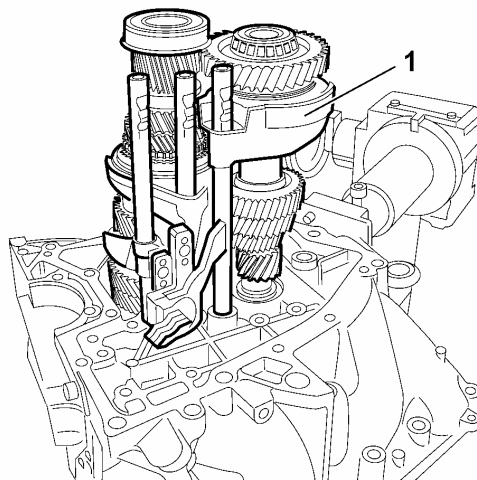
1. Unscrew the retaining screws (1a) and the stud (1b) and remove the cover of the differential (1c).



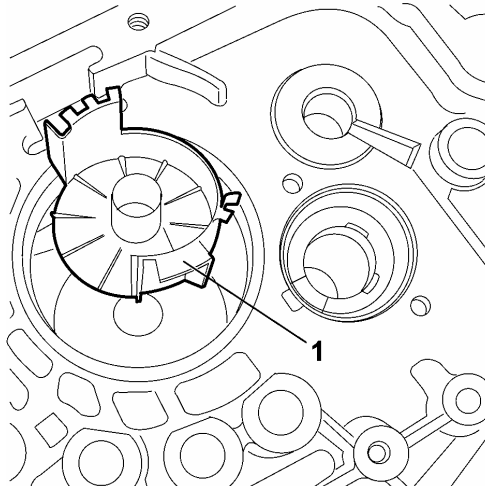
1. Remove the differential box.



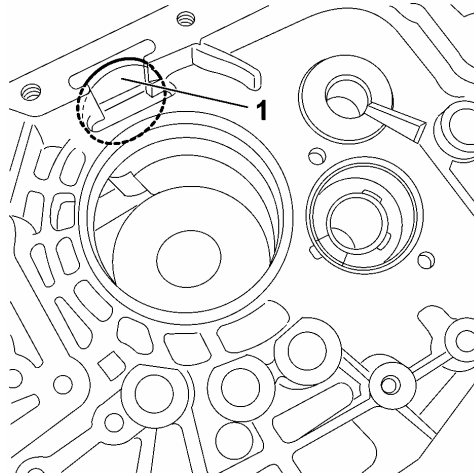
1. Remove the main shaft and the transmission shaft with the three forks.



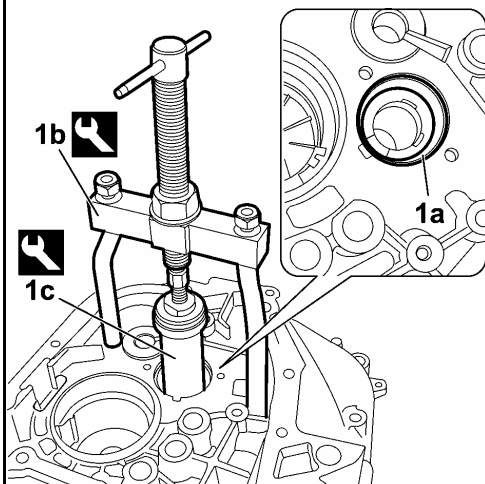
1. Remove the oil conveyor.



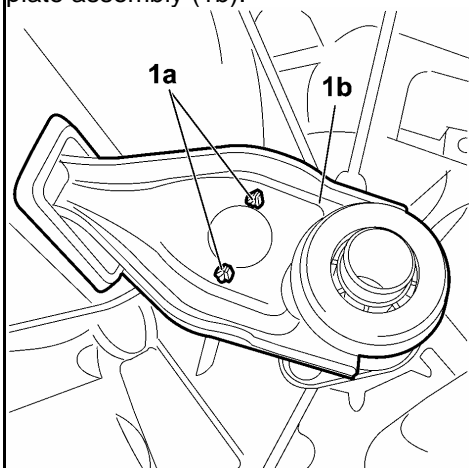
1. Remove the metal shavings magnet.



1. Remove the external rolling race of the thrust bearing (1a) using the tool (1b) and the tool (1c).

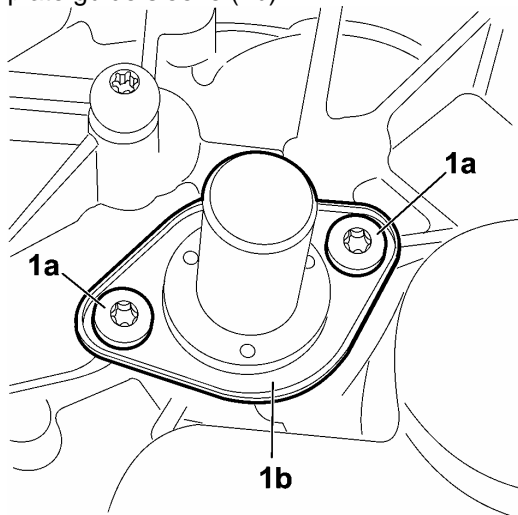


1. Fit the retaining clips (1a) and remove the pressure plate assembly (1b).

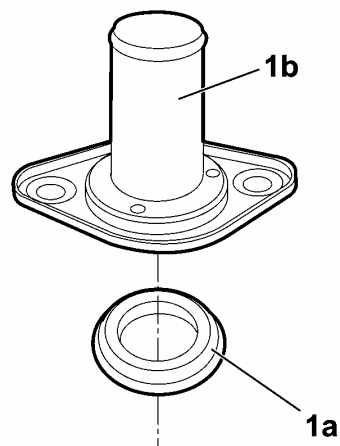


1. Remove the retaining base of the pressure plate lever.

1. Unscrew the screws (1a) and remove the pressure plate guide sleeve (1b).



1. Remove the oil seal (1a) from the pressure plate guide sleeve (1b).

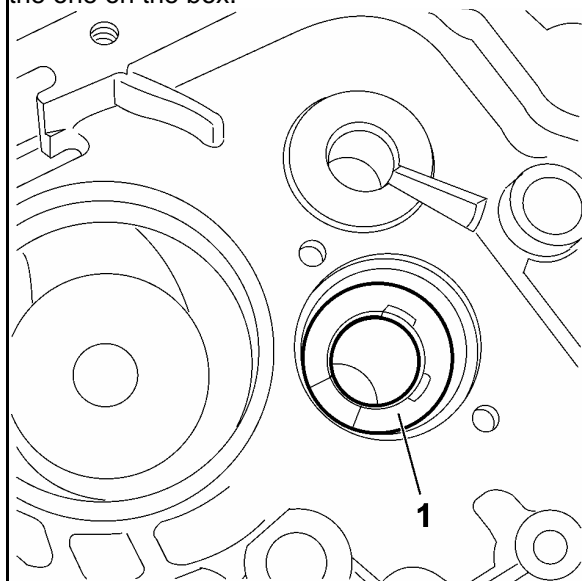


Reassembly

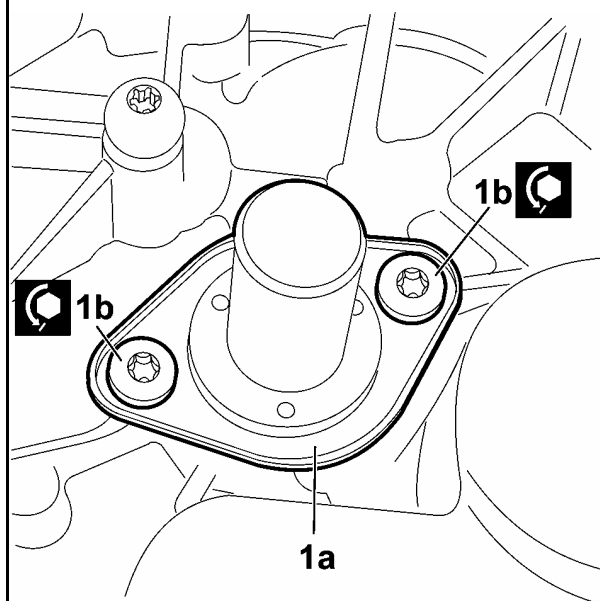
- Clean all the contact surfaces affected by the sealant.

- Wash the complete gearbox case and the gearing case.

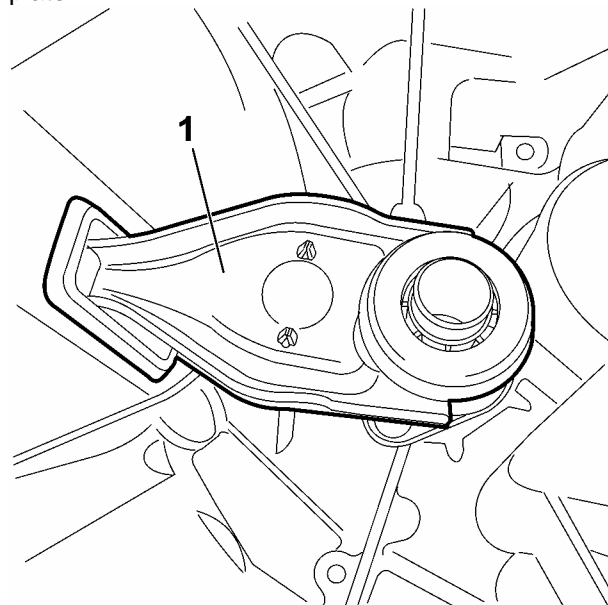
1. Fit the sealing gasket on the gearbox taking care to make the oil passage on the gasket coincide with the one on the box.



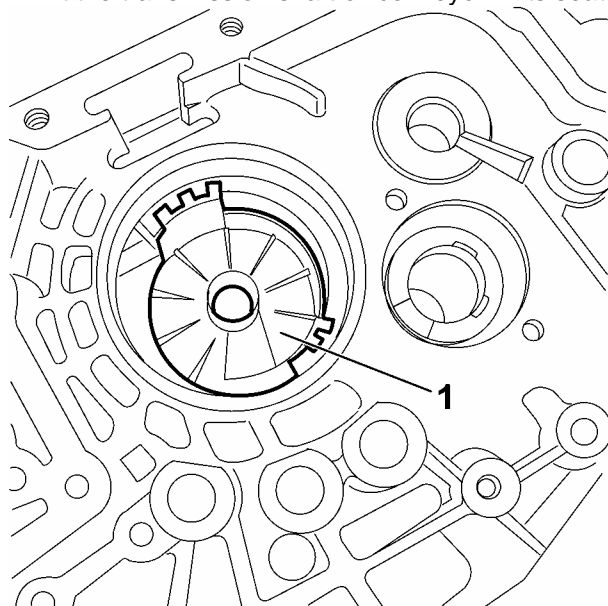
1. Fit the sleeve of the pressure plate (1a) and tighten the screws (1b) to the prescribed torque.



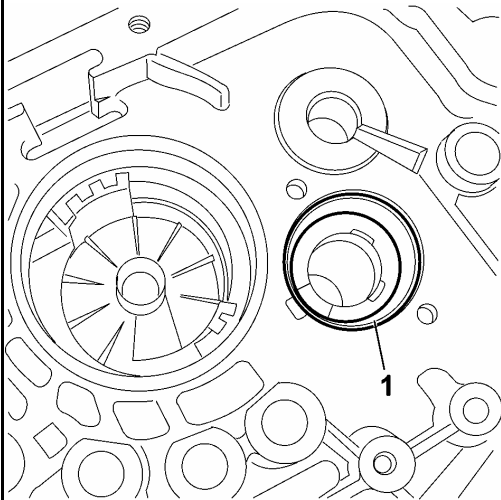
1. Fit the fork comprehensive of joint and pressure plate.



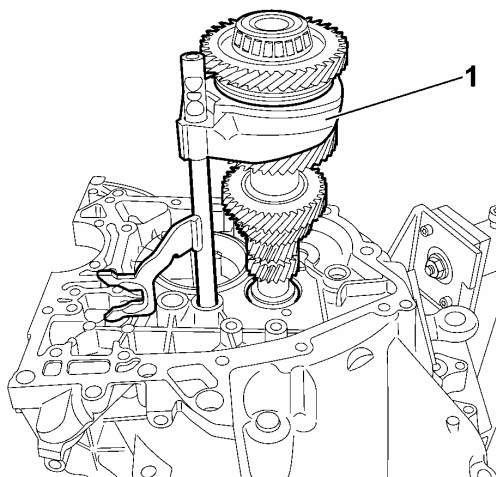
1. Fit the transmission shaft oil conveyor in its seat.



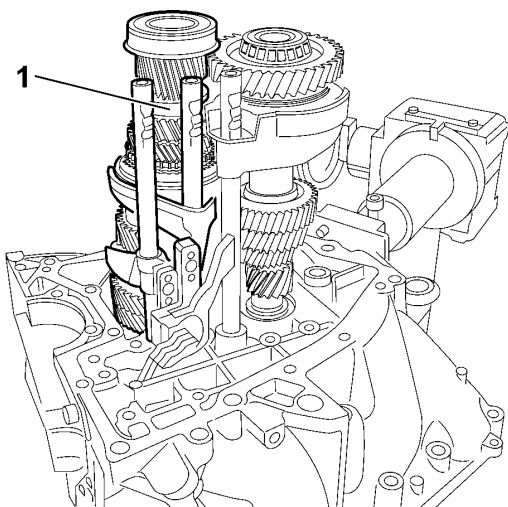
1. Fit the external race of the thrust bearing into place in its seat.



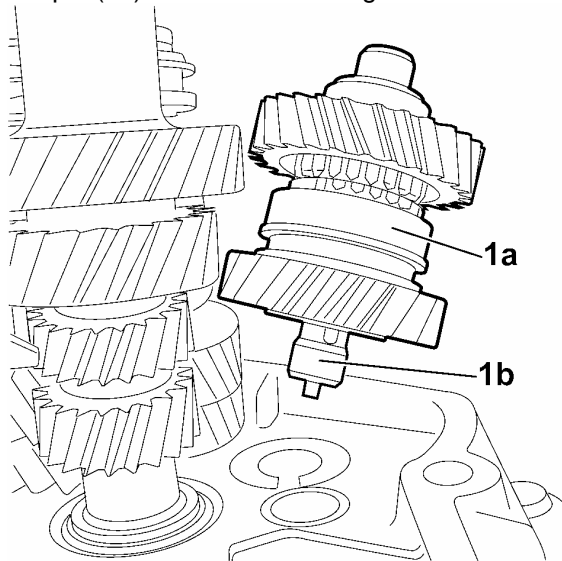
1. Fit the main shaft with the fork into place in its seat.



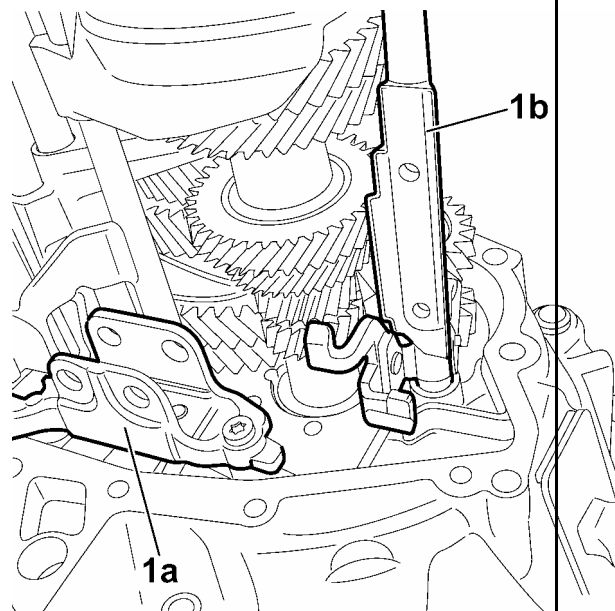
1. Fit the transmission shaft with the forks into place in its seat.



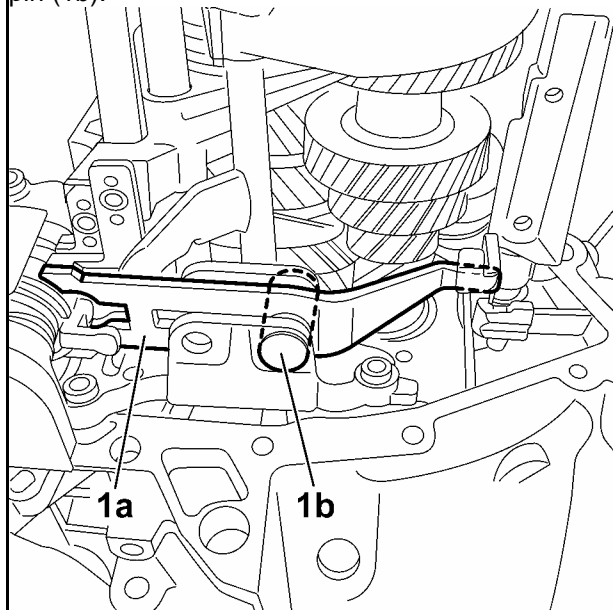
1. Fit the reverse gear shaft (1a) in its seat centring the pin (1b) in the seat on the gearbox.



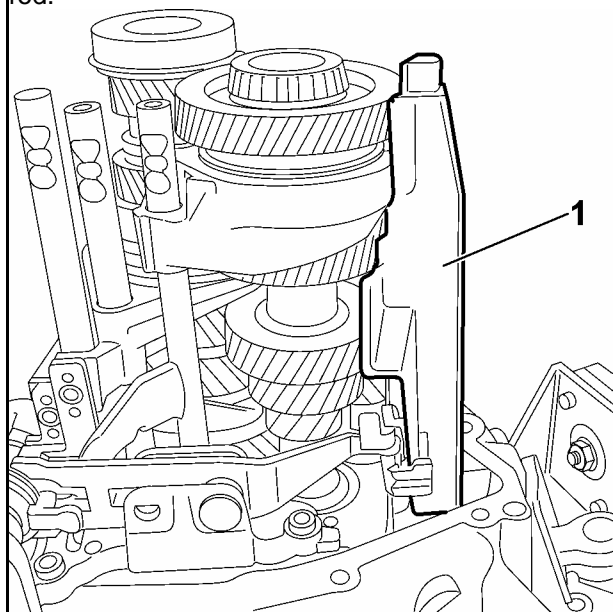
1. Fit the gear selector/engagement mechanism (1a) and the reverse gear fork (1b).



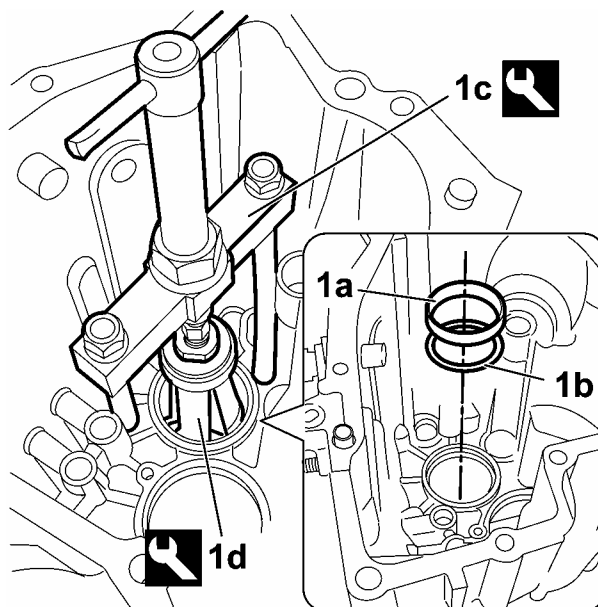
1. Fit the reverse gear selector bracket (1a) and the pin (1b).



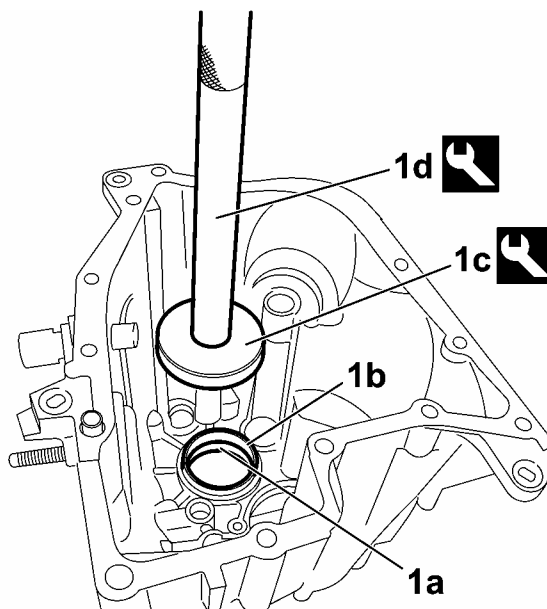
1. Fit the oil conveyor onto the reverse gear control rod.



1. Remove the outer ring of the bearing supporting the main shaft (1a) and the shim (1b) from the gearing case by using tools (1c) and (1d).

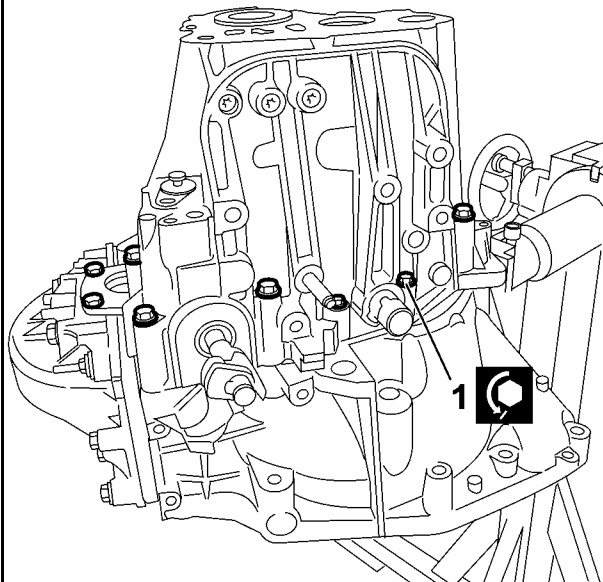


1. Fit the shim (1a) and the outer ring of the bearing supporting the main shaft (1b) in their seat using tools (1c) and (1d).

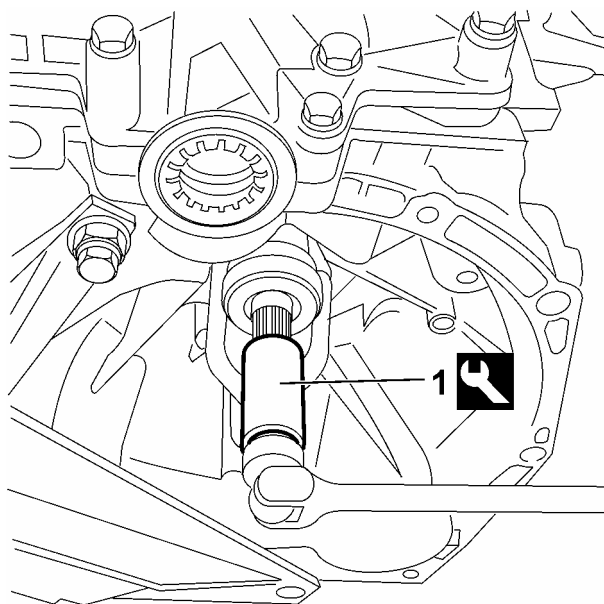


-Position the magnet in its seat in the gearing case.

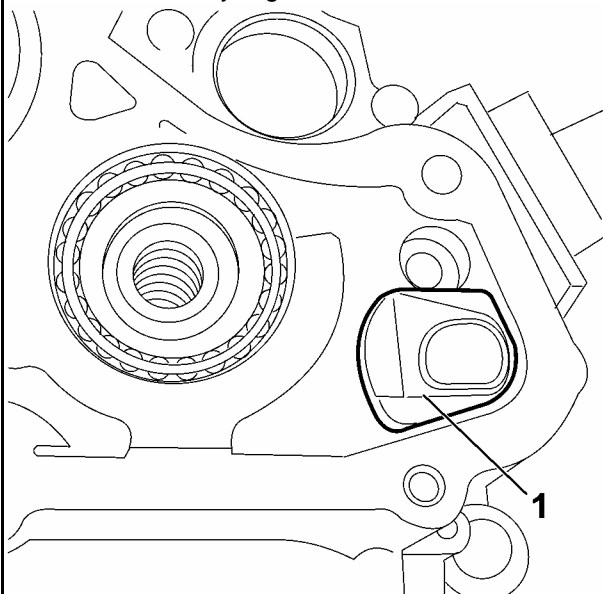
1. Apply the sealant and fit the cover of the gearing case. Tighten the screws to the prescribed torque.



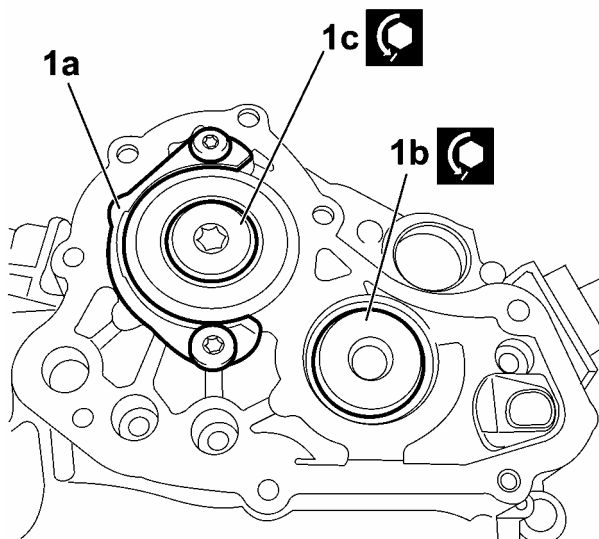
1. Engage a gear and keep the main shaft locked with the tool.



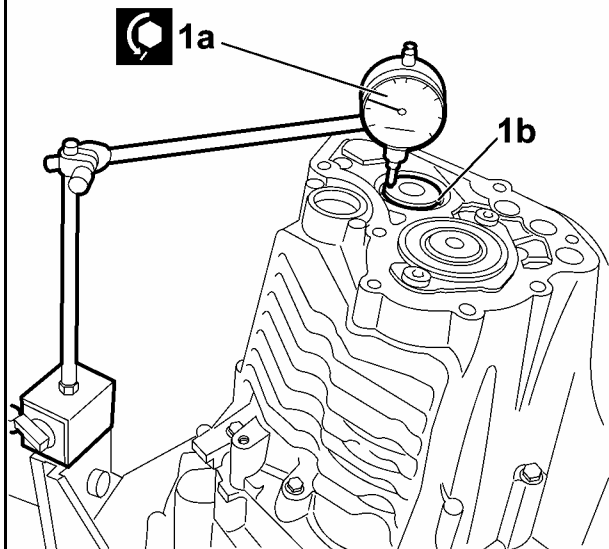
1. Fit the oil conveyor gasket.



1. Fit the bracket fixing the transmission shaft (1a), screw on the retaining screws of the main shaft (1b) and of the transmission shaft (1c) to the prescribed torque. Remove the locking tool.

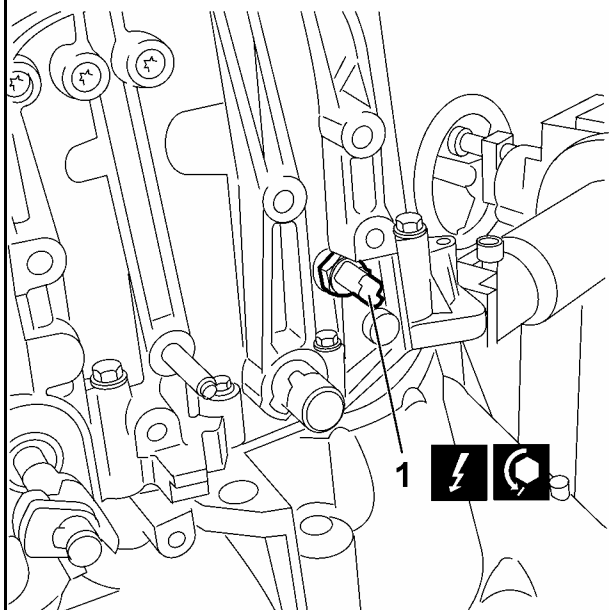


1. Use the dial gauge (1a) to check the end float of the main shaft (1b) by applying pressure from the bottom. The measured play must be between 0.06 mm and 0.15 mm. If the measurement is not between 0.06 mm and 0.15 mm renew the shim.

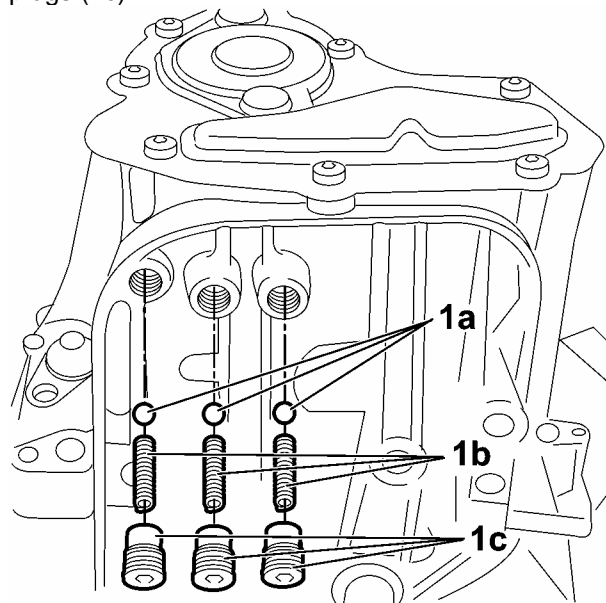


1. Apply the sealant, fit the cover (1a) into place and tighten the screws (1b) to the prescribed torque.

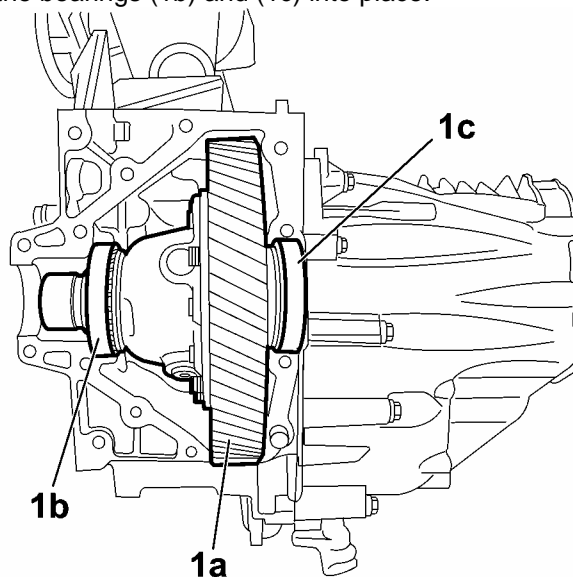
1. Fit the reverse gear sensor, screw down to the prescribed torque.



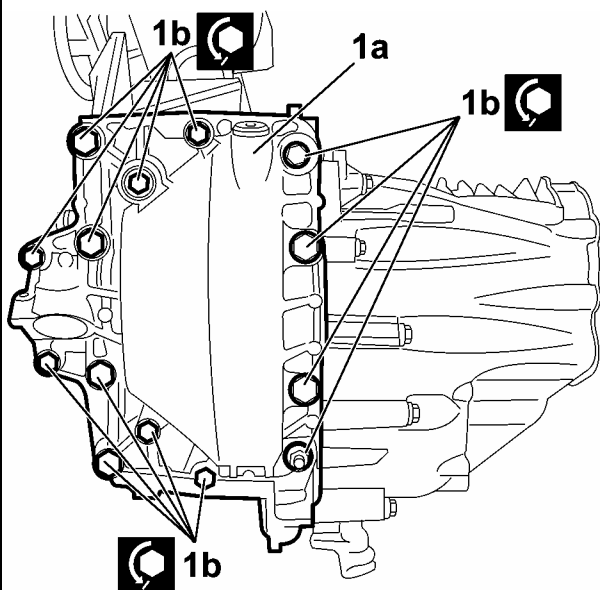
1. Fit the balls (1a), springs (1b) and screw on the plugs (1c).



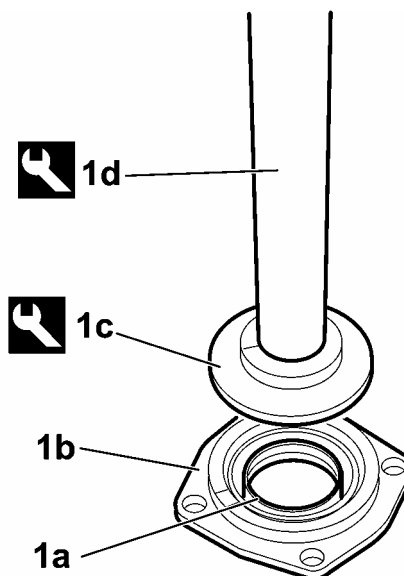
1. Fit the differential box (1a) and the outer races of the bearings (1b) and (1c) into place.



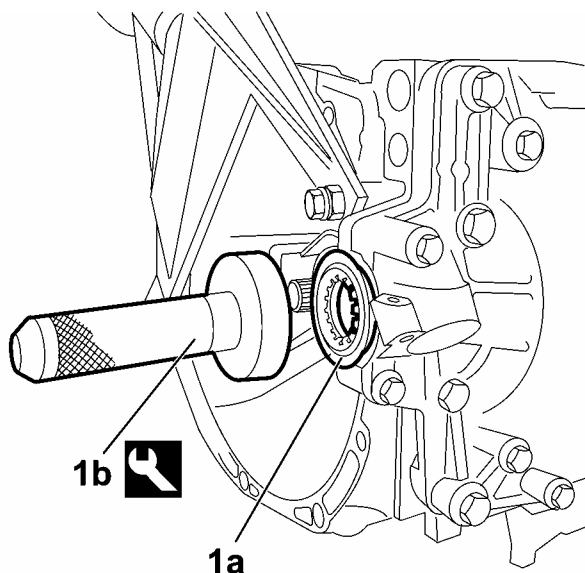
1. Fit the differential case cover (1a) and tighten the screws (1b) to the specified torque.



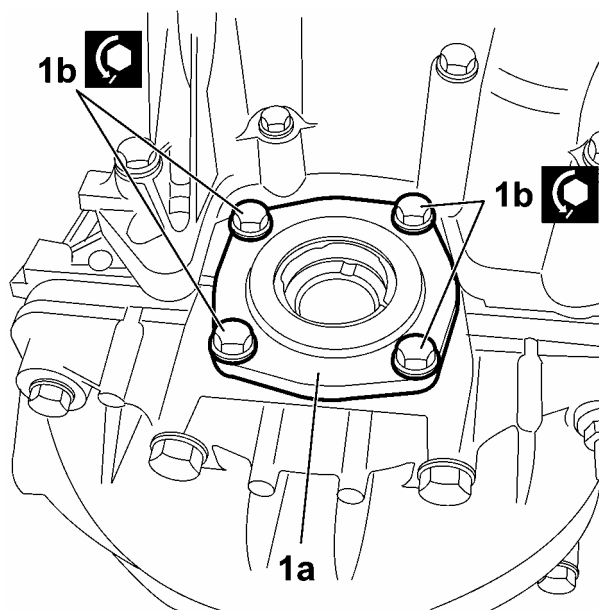
1. On the bench, insert a new oil seal gasket (1a) onto the flange on the gearbox side (1b) using the drift tool (1c) and (1d).



1. Install a new oil seal gasket (1a) on the clutch side using the drift tool (1b).



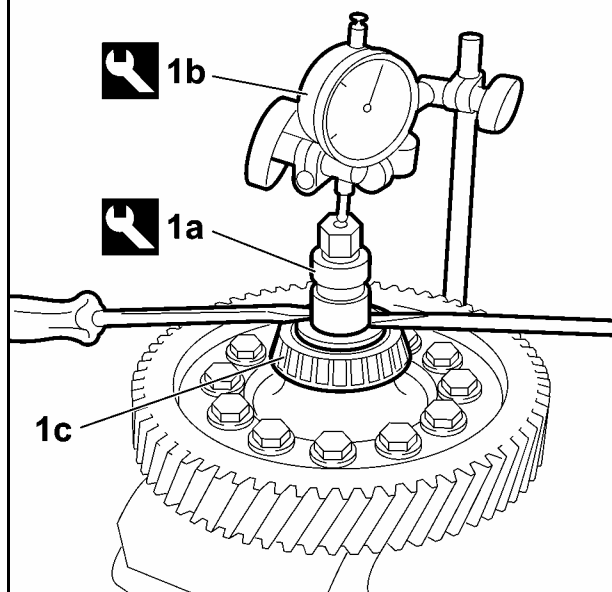
1. Apply the sealant, fit the flange (1a) on the differential case and tighten the screws (1b) to the specified torque.



- Fit the drain plug and tighten to the specified torque.
- Support the gearbox with a hydraulic lift.
- Unscrew the fasteners and remove the gearbox with the differential from the supporting tool.
- Remove the supporting tool from the overhaul stand.
- Fit the gearbox with the differential in place on a suitable board.

PROCEDURE FOR CHECKING DIFFERENTIAL CLEARANCE

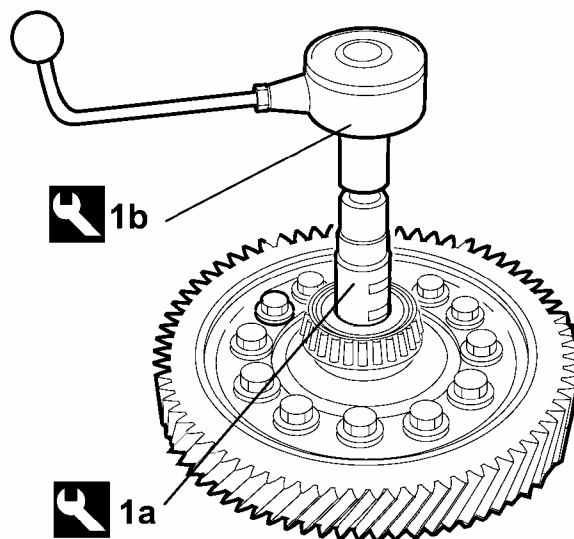
- Set the differential on the case side in a vice.
1. Using the tool (1a) and dial gauge (1b) check the axial play of the differential by applying pressure from the bottom in the seats (1c) with two screwdrivers. The tool (1a) should be positioned so that the lower grooves stay at the level of the differential shaft. The measured play must be no greater than 0.10 mm. If the measurement is greater than 0.10 mm renew the case side adjuster shim.



- Set the differential on the crown side in a vice.
- Using the tool and dial gauge check the axial play of the differential by applying pressure from the bottom in the seats with two screwdrivers. The tool (1a) should be positioned so that the lower grooves stay

at the level of the differential shaft. The measured play must be no greater than 0.10 mm. If the measurement is greater than 0.10 mm renew the crown side adjuster shim.

1. Using the tool (1a) and a torque wrench (1b), check that the rolling torque of the side pinions and crown wheels comes within the specified values



Tools for 2.0 Multijet Fiat NScudo Gearbox overhaul

Designation	Code	Function
Rotary stand supporting gearbox	1,871,000,000	Fixing gearbox for dismantling
Support for 1.871.000.000	1,871,001,014	Support for fixing gearbox for dismantling
Blade	1,870,718,000	Sealant removal
Main shaft stop	2,000,021,200	Main shaft locking
Reaction plate	1,870,808,000	Bearing removal
Plates	1,846,992,000	Transmission shaft bearing disassembly
Plates	2,000,005,000	Supporting plates
Slide hammer	1,875,088,000	Removal/fitting main shaft bearing
Drift tool	1,870,152,000	Fitting main shaft bearing
Drift tool	1,870,899,300	Fitting main shaft bearing
Drift tool	1,860,488,000	Fitting bearing
Grip	1,874,365,000	Fitting bearing
Slide hammer	2,000,004,700	Transmission shaft bearing disassembly
Drift tool	1,870,632,000	Fitting transmission shaft bearing
Drift tool	1,875,059,000	Fitting corteco
Drift tool	1,870,658,000	Bearing drift tool
Adjuster	2,000,021,100	Tool to check end float
Drift tool	1,874,088,000	Bearing drift tool



Designation	Code	Function
USAG tool	468/2	Bearing removal
USAG tool	468A/6	Bearing removal
USAG extractor	427A/3	Removal/fitting main shaft bearing
USAG tool	Usag 472/3	Bearing removal
USAG tool	Usag 472A/3	Bearing removal



5. BRAKING SYSTEM

5.1 ABS BOSCH 8.0

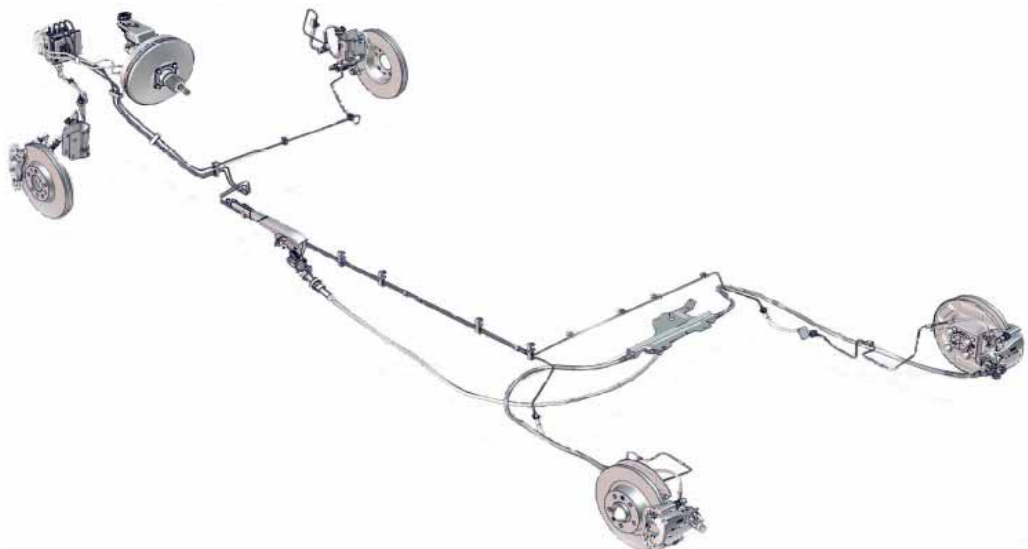
Braking system

General

The ABS Bosch 8.0 system, an integral part of the braking system, prevents one or more wheels locking and as a result slipping on a slippery road surface or when braking sharply, thereby ensuring vehicle control even during emergency braking.

The ABS system has a hydraulic control unit with 8 solenoid valves (12 for ESP versions), 4 active sensors and 4 channels with electronic braking force distribution (EBD) , which permits dividing the braking action between the front and rear wheels.

System diagram



On a braking system with rear disc brakes, the parking brake is obtained in the disc brakes with a system called "Drum in Hat" that consists of a drum brake inside the brake disc.



Functional diagram

The following figures show the functional diagrams for the ABS 8.0 braking system with and without ESP.

Diagram of ABS without ESP

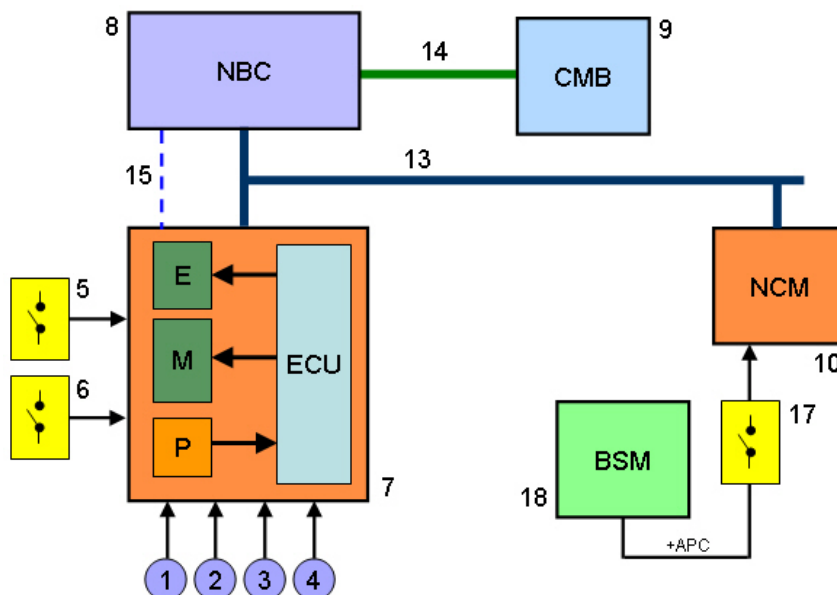
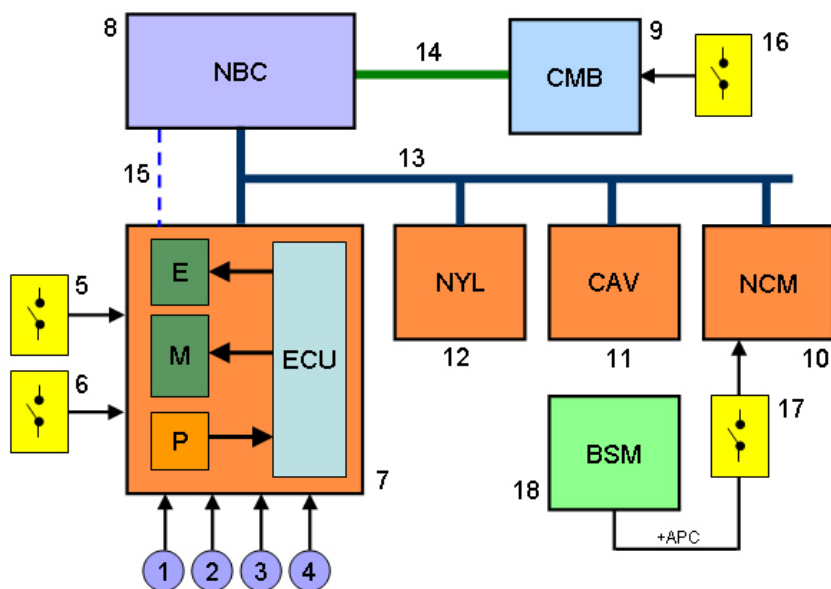


Diagram of ABS with ESP



Functional diagrams key:

1. Front left wheel sensor
 2. Front right wheel sensor
 3. Rear left wheel sensor
 4. Rear right wheel sensor
 5. Brake wear switch
 6. Brake fluid switch
 7. ABS control unit
 8. Body Computer
 9. Instrument panel
 10. Engine control unit
 11. Steering angle sensor
 12. Yaw/side acceleration and longitudinal acceleration sensor
 13. High speed Can line (HS IS)
 14. Comfort Can line (LS)
 15. Brake lights control signal
 16. ESP cut-out switch
 17. Brake pedal switch
 18. BSM Engine compartment fuse box
 - E. Solenoid valves inside the ABS electro-hydraulic unit
 - M. Electric motor of the ABS electro-hydraulic unit
 - P. Pressure sensor inside the ABS electro-hydraulic unit
- +APC: Key-controlled power supply

Functions of the ABS system

The ABS 8.0 braking system incorporates the following functions:

- ESP (Electronic Stability Program)
- ASR (Antislip Regulator)
- MSR (Motor Speed Regulator)
- HH (Hill Holder)
- HBA (Hydraulic Brake assistant)

ESP (Electronic Stability Program)

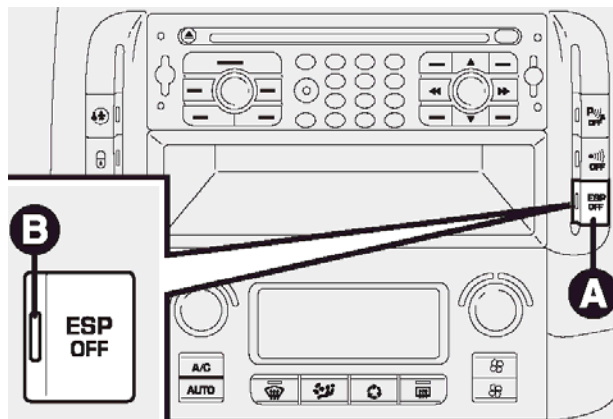
This is a vehicle stability control system that helps maintain directional control if the tyres lose grip.

The system triggering is signalled by a warning light blinking on the instrument panel to tell the driver that the vehicle has critical conditions of stability and grip.

The ESP system automatically engages on starting the vehicle and can be turned off by pressing a button (A) among the central controls on the dashboard.

Turning off is signalled by the LED (B) on the button lighting up.





In the event of trouble the ESP system cuts out automatically and the warning light comes on steady on the instrument panel.

ASR SYSTEM (Antislip Regulator)

This is a traction control system for the vehicle that trips automatically if one or both driving wheels slip.

Two different control systems are actuated, depending on the slip conditions:

- if both driving wheels slip, the ASR trips reducing the power output transmitted by the engine;
- if only one driving wheel slips, the ASR comes into operation by automatically braking the slipping wheel.

The action of the ASR system is especially useful under the following conditions:

- inside wheel slipping on a bend, due to dynamic changes in the load or excessive acceleration;
- excessive power transmitted to the wheels, even depending on the road surface conditions;
- vehicle acceleration on slippery, snow-covered or icy road surfaces;
- loss of grip on a wet surface (aquaplaning).

The ASR automatically turns on every time the engine is started.

Turning off the ESP system automatically turns off the ASR system too.

If the ASR is turned off while driving, when later starting it will automatically turn back on again.

When driving on a snow-covered surface with snow chains fitted, it may be useful to turn off the ASR: under these conditions the slip of the driving wheels in the pick-up phase makes greater traction possible.

In the event of trouble the ASR system cuts out automatically and the warning light comes on steady on the instrument panel.



WARNING: For the ESP and ASR system to work properly it is essential for the tyres to be of the same brand and type on all the wheels, in perfect condition and above all of the specified type, make and size.

MSR (Motor Speed Regulator)

This system is an integral part of the ASR that trips in the event of a sharp change of gear when climbing, giving torque back to the engine and thereby avoiding excessive drive of the driving wheels that, especially when there is poor grip, can lead to a loss of stability of the vehicle.

HH (Hill Holder)

This is an integral part of the ESP system that helps hill starts.

It is turned on automatically under the following conditions:

- **uphill:** vehicle stationary on a road with a gradient steeper than 5%, engine running, clutch and brake pedals pressed and gearbox in neutral or any gear engaged other than reverse.
- **downhill:** vehicle stationary on a road with a gradient steeper than 5%, engine running, clutch and brake pedals pressed and reverse gear engaged.

Operation : In the pick-up phase the ESP system control unit keeps the braking pressure at the wheels until the driving torque needed for starting is reached, or anyhow for a maximum time of 2 seconds, making it possible to easily move the right foot from the brake pedal to the accelerator.

After the 2 seconds, without starting, the system automatically turns off, gradually releasing the braking pressure.

During this release phase it is possible to hear a typical mechanical uncoupling noise from the brakes, indicating that the vehicle is about to move.

Any trouble with the system is signalled by the warning light on the instrument panel.

WARNING The Hill Holder system is not a parking brake, therefore do not leave the vehicle without applying the handbrake, switching off the engine and engaging the first gear.

HBA (Hydraulic Brake assistant)

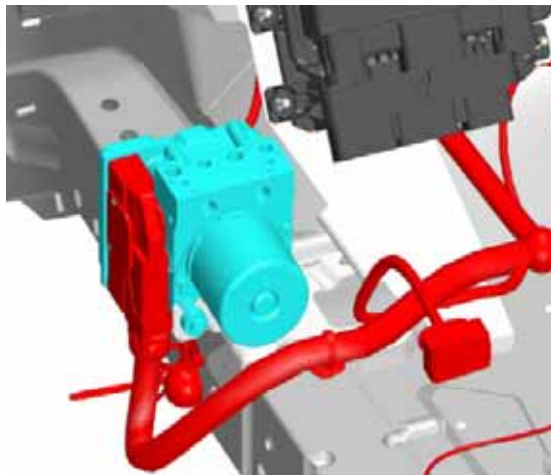
Electro-hydraulic braking assistant that automatically increases the pressure of the braking circuit during panic braking.

Component layout

ABS control unit

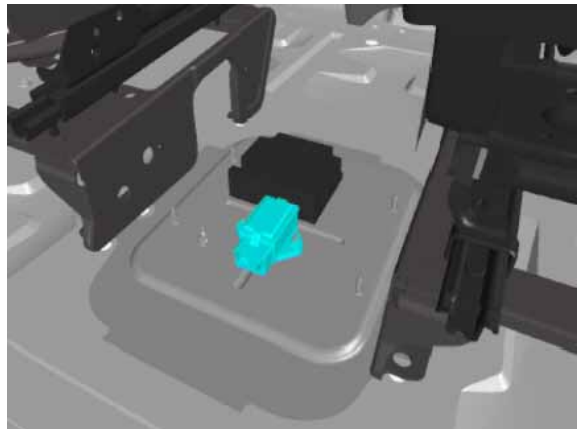
The electronic control unit is incorporated in the electro-hydraulic assembly and is located in the engine compartment on the left-hand side.





Yaw/side acceleration and longitudinal acceleration sensor

This sensor is located in the middle of the vehicle between the two front seats. It is interfaced with the electric system via the high speed CAN line (HS IS).
This sensor is used by the ESP and Hill Holder system.

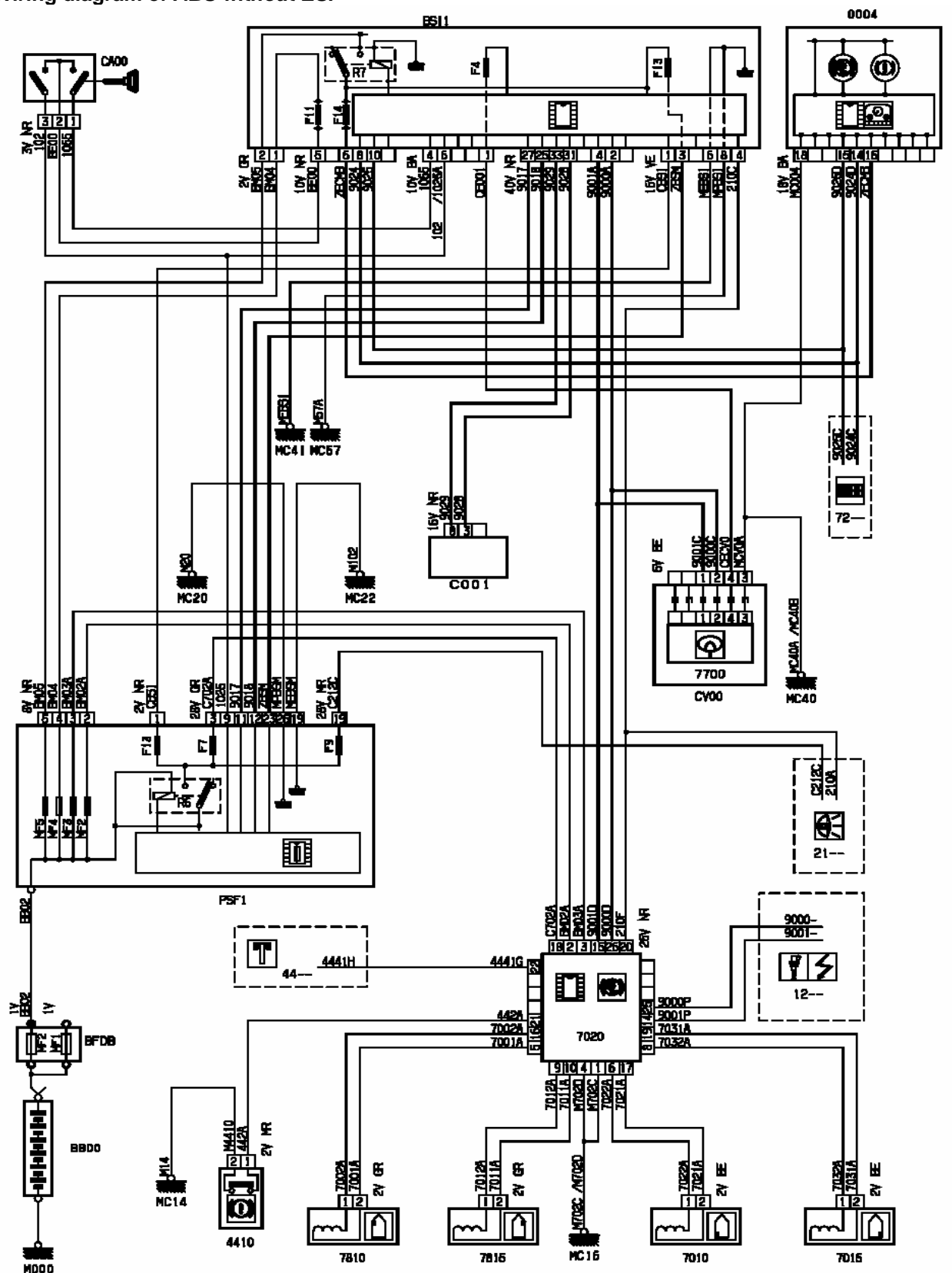


Steering wheel angle sensor

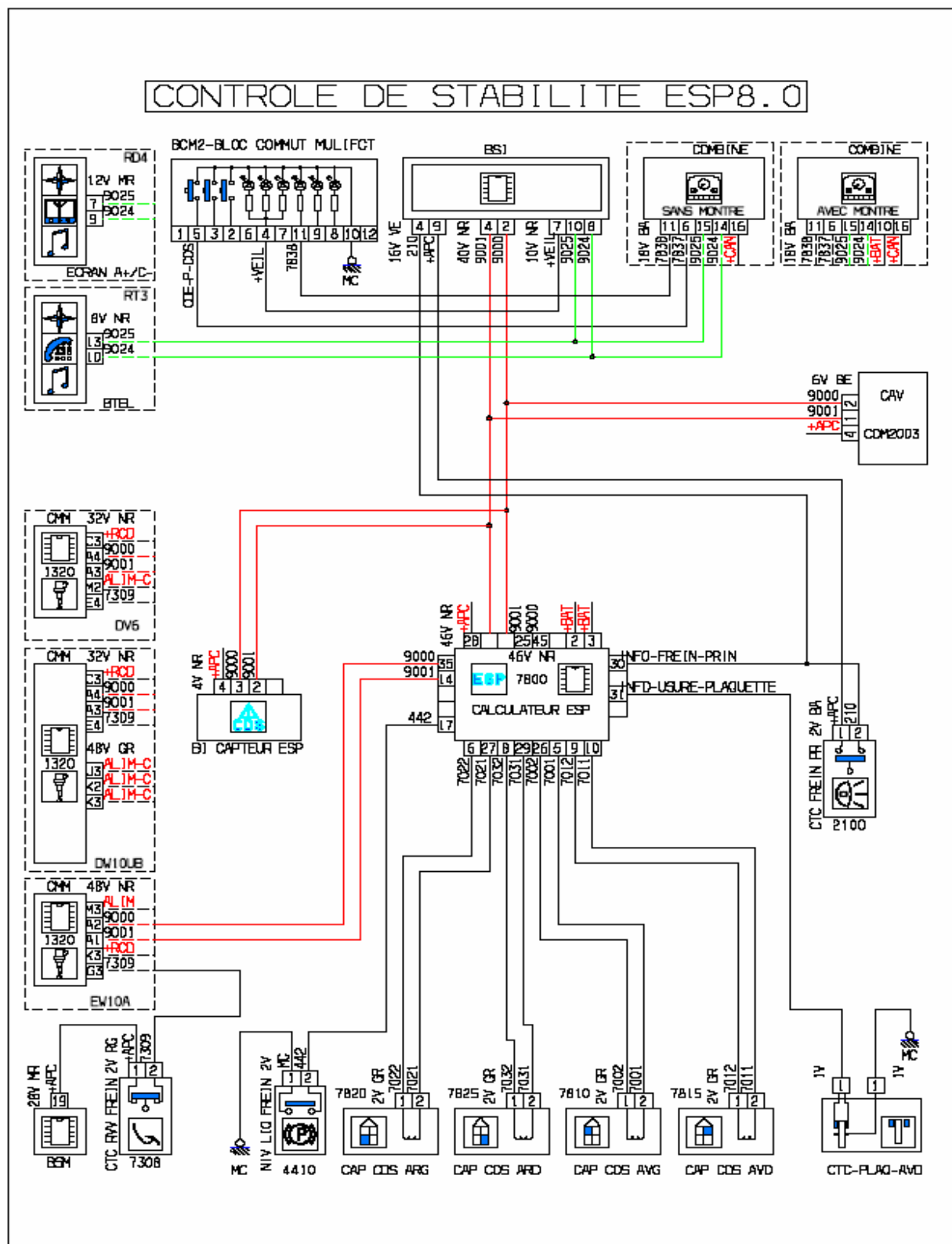
The steering wheel angle sensor is incorporated in the stalk unit.



Wiring diagram of *ABS without ESP*



Wiring diagram of ABS with ESP



Wiring diagrams key:

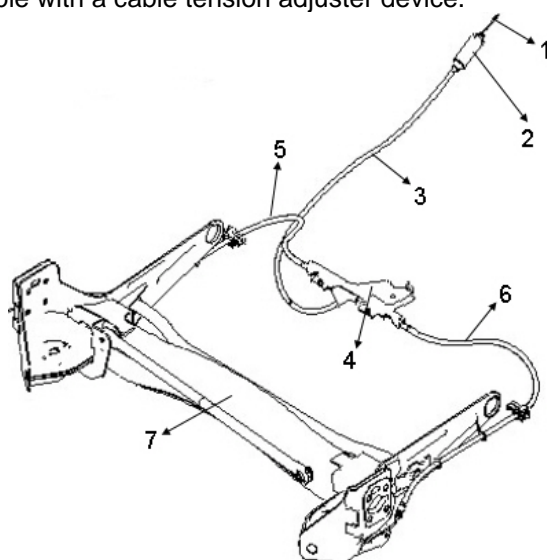
21-- : brake lights control signal (from Body Computer)
2100: brake lights control signal (from Body Computer)
44-- : Brake pad wear switch
4410 : Brake fluid switch
7010: rear left wheel sensor
7015: rear right wheel sensor
7020: ABS control unit
7308: Brake pedal switch
7800: ABS control unit
7810: front left wheel sensor
7815: front right wheel sensor
CAV : Steering angle sensor
Capteur ESP : Yaw/side acceleration and longitudinal acceleration sensor
Combinè: Instrument panel
CMM: Engine control unit
CV00 : MODULE DE COMMUTATION SOUS VOLANT (COM 2000)
C001 : Diagnosis connector
CTC-PLAQ-AVO: Brake wear switch
CAP COS ARG : Rear left wheel ABS sensor
CAP COS ARD : Rear right wheel ABS sensor
CAP COS AVG : Front left wheel ABS sensor
CAP COS AVD : Front right wheel ABS sensor
BCM2: Controls cluster on the dashboard
BFDB : Max fuses on the battery positive cable
BB00 : Battery
CA00 : Ignition block
PSF1 : PLATINE DE SERVITUDE-BOITE FUSIBLES
BSI : Body Computer (NBC)
BSM: Engine compartment fuse box
0004 : Instrument panel



5.2 PARKING BRAKE (ADJUSTMENTS)

Parking brake with cable tension adjuster

The parking brake uses a cable with a cable tension adjuster device.



Key:

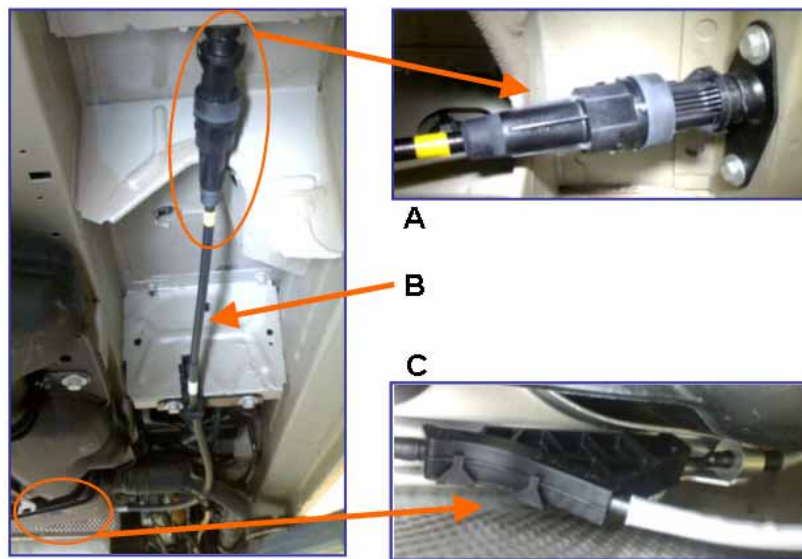
- 1. Cable towards passenger compartment lever
- 2. Automatic adjuster
- 3. Main cable

- 4. Mechanical divider
- 5. Left secondary cable
- 6. Right secondary cable
- 7. Rear axle

Position of components

The parking brake adjuster device is located under the vehicle on the driver's side (LH).

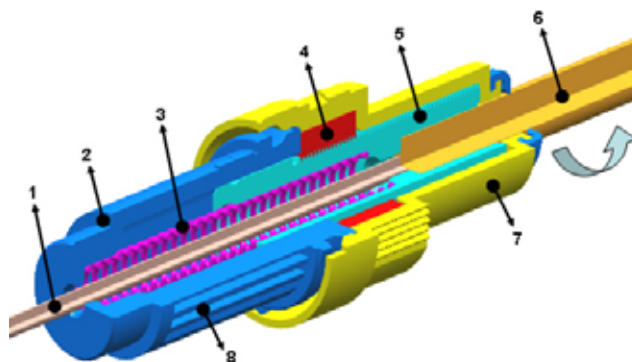




A: adjuster device **B:** Main cable **C:** Mechanical cable divider

Parking brake tension adjuster device

The figure shows the internal composition of the adjuster device.



Key:

- 1. Cable (towards parking brake lever)
- 2. Body of the device
- 3. Spring
- 4. Nut

- 5. Screw
- 6. Main cable sheath
- 7. Movable part
- 8. Fixed part

Operation of the tensioning device

The tensioning device has two operating positions:

- locked 1.B (padlock closed),
- unlocked 2.S (padlock open).





1.B



2.S

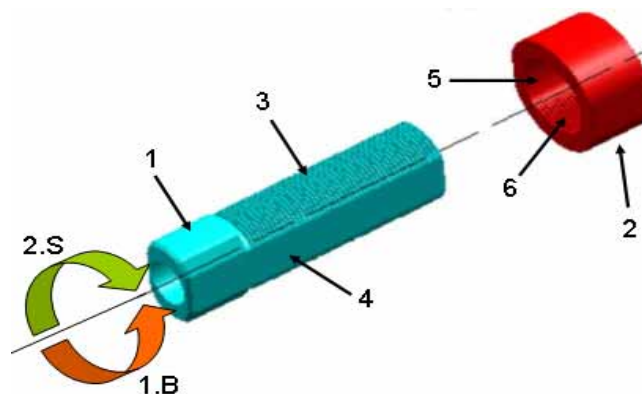
1.B : device locked **2.S** : device unlocked

In position (1.B) the screw and nut are locked and cannot slide since the saw-tooth portion (3 and 6) of the screw and nut is aligned. In this position no adjustments are possible.

In position (2.S) the screw and nut are unlocked and therefore the screw can slide because the saw-tooth portion (3) of the screw (1) coincides with the smooth portion (5) of the nut (2).

In this position, pushing the main sheath towards the device adjusts the tension of the parking brake cables.

Note: Do not leave the adjuster device in the unlocked position (position 2.S).



Key:

- 1. Screw
- 2. Nut
- 3. Knurled part of the screw
- 4. Smooth part of the screw

- 5. Smooth part of the nut
- 6. Knurled part of the nut
- 1.B Rotation to lock the device
- 2.S Rotation to unlock the device.



Procedure for parking brake cable tension adjustment.

1 Set the vehicle on a lift to provide access to the underbody.

2 Turn the bottom and align the arrow on the device with the open padlock.



3 With one hand grip the main sheath of the parking brake and push towards the device to align the yellow reference mark with the impermeability joint.



4 Turn the bottom and align the arrow on the device with the Closed padlock.



5 Lower the vehicle until the wheels make contact with the ground.

6 Get into the vehicle and start the engine.

7 Operate the brake pedal 3 times.

8 Switch off the engine.

9 Get out of the vehicle.

10 Raise the lift to provide access to the underbody

11 Turn the bottom and align the arrow on the device with the open padlock.



12 Turn the bottom and align the arrow on the device with the closed padlock.



13 Lower the vehicle until the wheels make contact with the ground.

14 Get into the vehicle and operate the handbrake lever 15 times.

15 Get out of the vehicle and make sure the parking brake is disengaged.

16 Raise the lift to provide access to the underbody

17 Turn the bottom and align the arrow on the device with the open padlock.



18 Turn the bottom and align the arrow on the device with the closed padlock.



19 Using a torque wrench measure 8Nm at pick-up (that is when the wheel starts to turn) without knocking.

Note:

- Turn the wheel in the vehicle's direction of travel.
- Parking brake disengaged.

20 If the measurement exceeds 8 Nm, carry out the parking brake adjustment procedure again

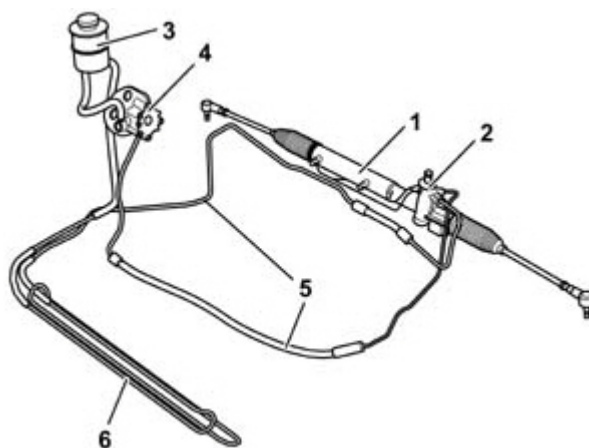


6. STEERING

6.1 Hydraulic power steering (1.6 MULTIJET 90 CV)

The power steering with belt-driven hydraulic pump is the type with variable assistance in relation to the engine speed.

The operating principle is tied to the characteristics of the pump that reduces the oil flow rate and as a result the level of interlocking as the engine rpm increases.



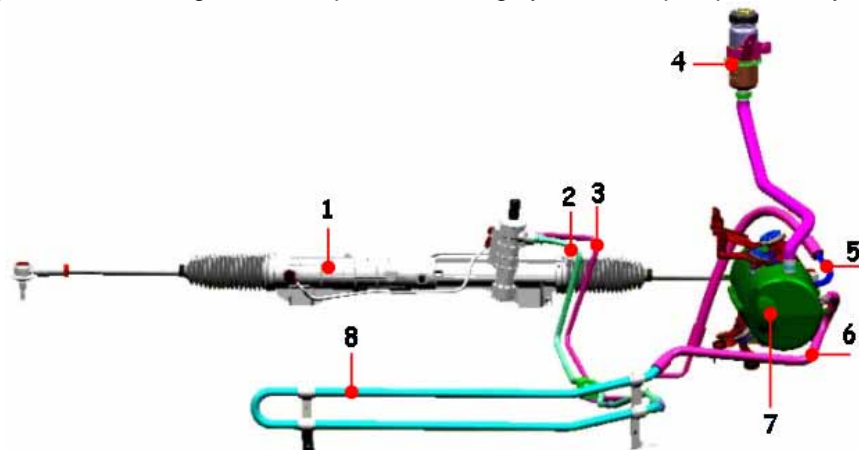
Key:

- 1 - power steering box
- 2 - steering column coupling
- 3 - power steering fluid tank
- 4 - power steering pump
- 5 - pipes
- 6 - cooling coil (where applicable)



6.2 POWER STEERING WITH ELECTRO-HYDRAULIC INTERLOCK (2.0 MULTIJET)

The following figure shows a diagram of the power steering system with pump driven by an electric motor.



Key:

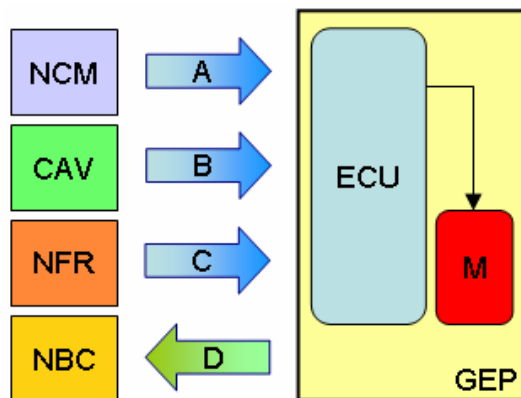
- | | |
|--|-------------------------------------|
| 1. Power steering | 5. High pressure pipe (pump outlet) |
| 2. Return pipe | 6. Return pipe |
| 3. High pressure pipe (power steering inlet) | 7. Pump assembly (GEP) |
| 4. Oil top-up tank | 8. Coil for oil cooling |

Functional diagram

The following figure shows the flow of information needed for operation of the power steering system with an electric pump.

The GEP control unit receives the following information from the CAN HS IS network:

- A : Thermal status of the engine
- B : Steering wheel rotation speed
- C : Vehicle speed
- D : Interlock status



According to this information the control unit (ECU) commands the electric motor (M) of the steering interlock hydraulic pump.

In its turn the GEP control unit sends the Interlock Status (**D**) to the Body Computer Node (NBC) via the Can HS IS network.

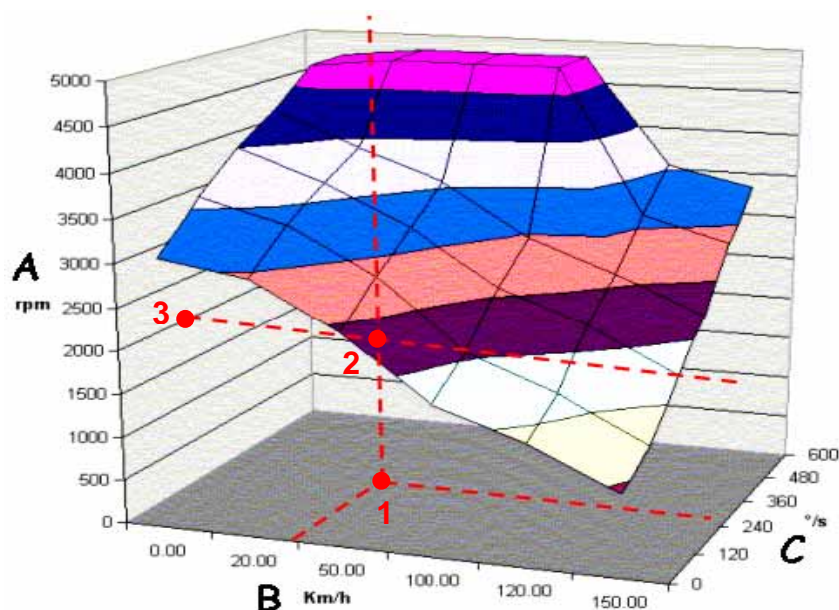
Operation

GEP system interlock is obtained by changing the speed of rotation of the electric motor of the pump assembly.

The reference parameters are:

- Vehicle speed
- Steering wheel angle speed

The following graph illustrates the interlock map.



Example: (B: 20 Km/h - C: 240 °/s)

The vertical passing through point (1) determines the command strategy (2) on the graph for the electric motor of the mechanical oil pump. This command is translated into keeping the electric motor at an exact number of revs (3) that, in its turn, determines a certain pressure in the hydraulic circuit corresponding to the required level of steering interlock.

Graph key:

A: Electric motor revs (GEP)

B: Vehicle speed

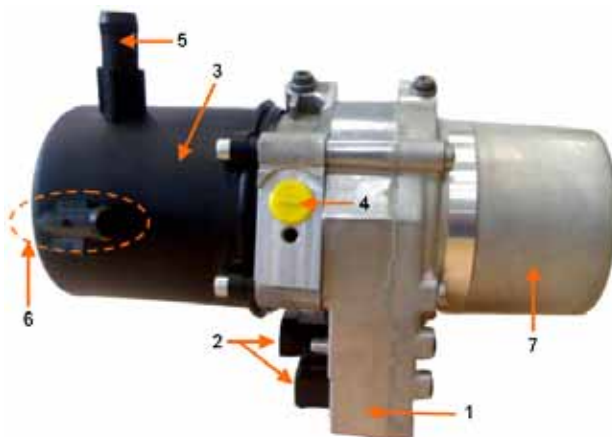
C: Steering wheel angle speed



Motor pump assembly

The motor pump assembly is composed of three main sections:

- Electric motor section (7)
- Central section accommodating the electronic control unit (1)
- Mechanical gear pump section (3)



Key:

1. Electro-hydraulic steering control unit.
2. Electric connectors.
3. Oil pump cover/tank.
4. Oil outlet (high pressure)
5. Oil inlet from the oil top-up tank
6. Oil return inlet
7. Pump electric motor

Pump assembly location

The following figure shows the position of the pump assembly (GEP).
The pump assembly is located in the area of the left wheelhouse.



Oil top-up tank location

The figure below shows the position of the oil top-up tank.

The oil top-up tank is located in the engine compartment on the left-hand side.

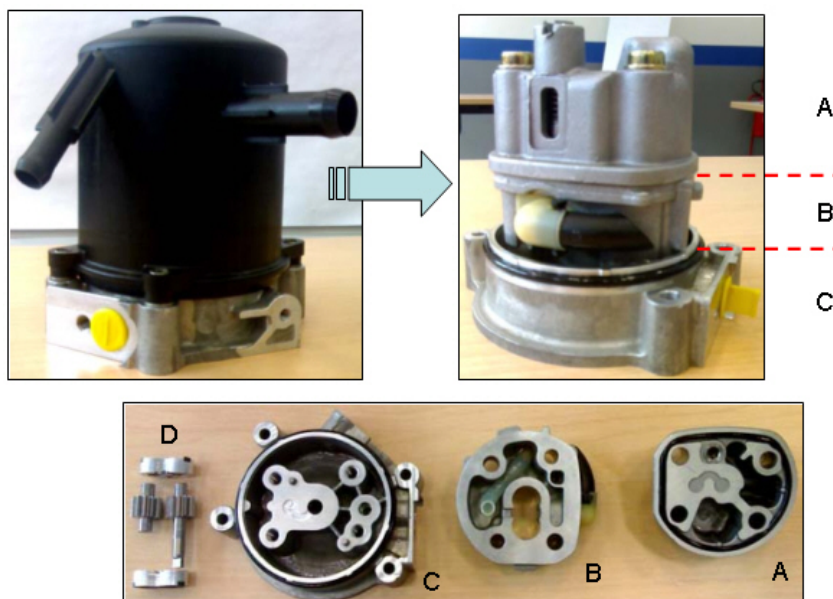


Pump dismantling

The figures below illustrate the details of the power steering system oil pump.

This pump is divided into three parts:

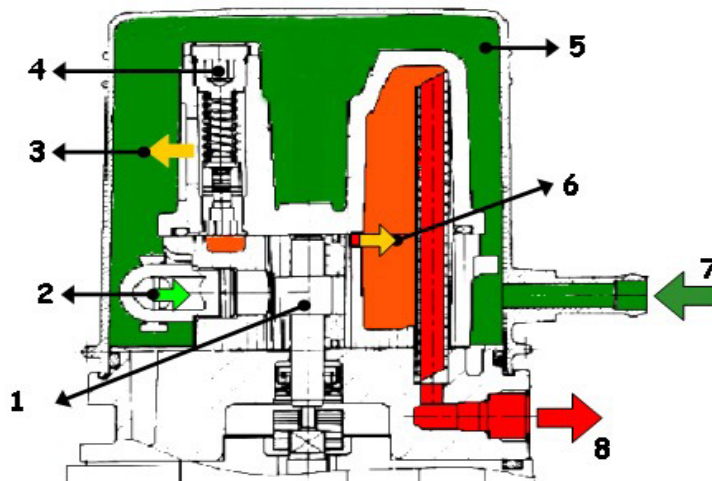
- **A** : Pump cover and seat of the oil pressure regulator valve.
- **B** : Support of the gear pump (D) and oil intake and compression chamber.
- **C** : Base of the pump and interface with the electric motor. Here is the seat of the H.P. oil outlet
- **D** : Oil gear pump



Pump operation

The oil enters through the coupling (7) filling the oil tank (5). The mechanical pump (1) draws in oil through the line (2) and drives it through the outlet (6). The high pressure oil supplies the power steering system through the coupling (8).

If the safety pressure threshold is exceeded, the mechanical spring valve (4) opens activating a by-pass (3) between the high and low pressure.



Key:

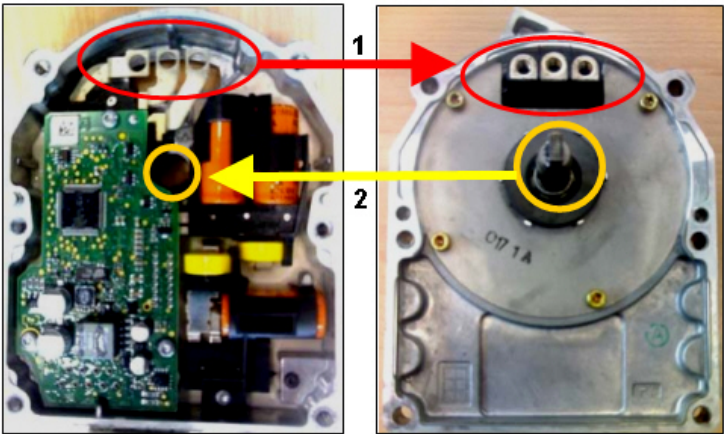
- 1. Oil mechanical gear pump
- 2. Mechanical pump oil inlet
- 3. Oil outlet from pressure regulator
- 4. Pressure regulator

- 5. Oil tank
- 6. Oil outlet from mechanical pump (high pressure)
- 7. Oil inlet from the oil top-up tank
- 8. Oil outlet for steering box (high pressure)



Electro-hydraulic steering control unit

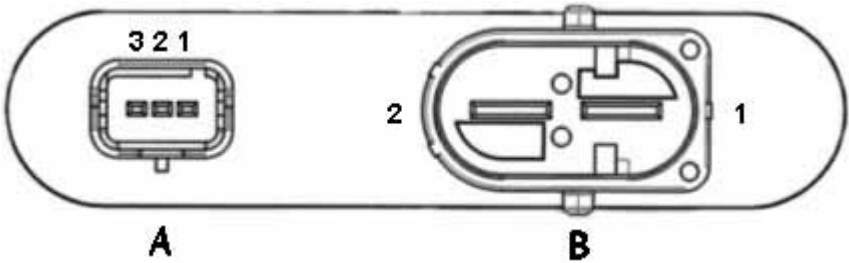
The electro-hydraulic steering control unit is an integral part of the motor pump assembly.



The electronics incorporate:

- A temperature sensor to prevent excessive and hazardous overheating.
- A Hall effect sensor to measure the speed of the electric motor.

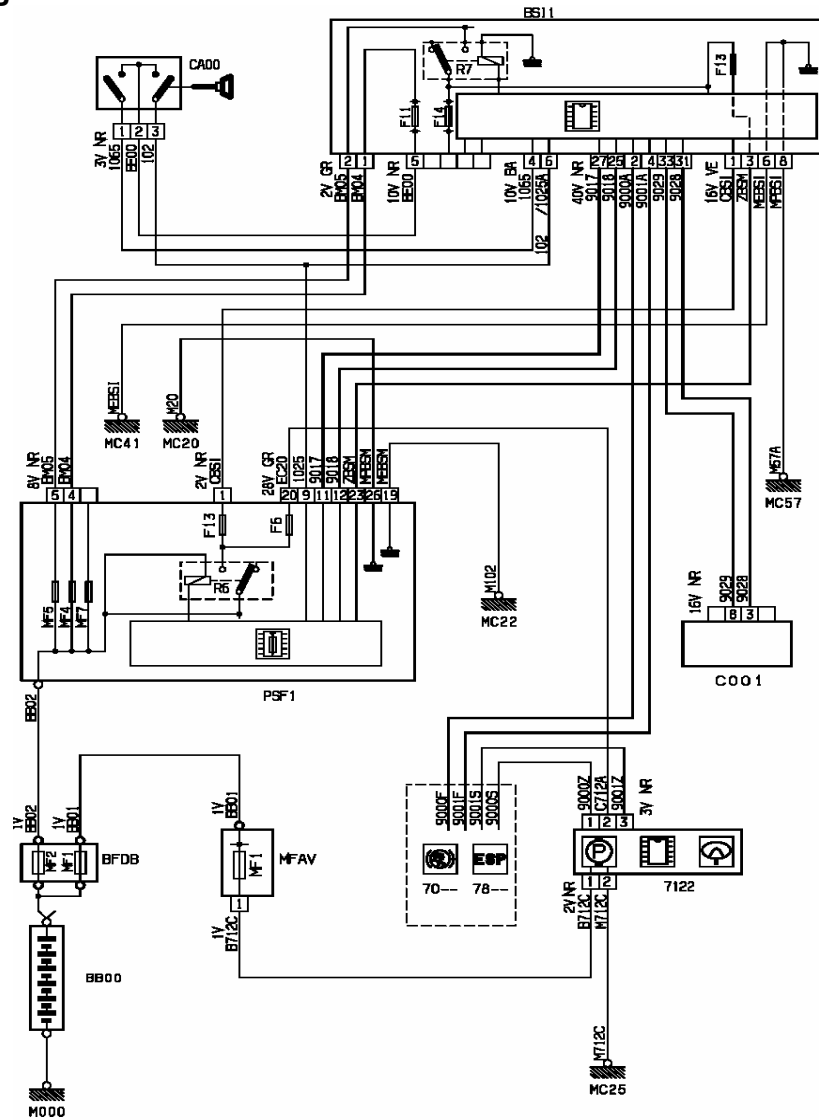
Electro-hydraulic steering control unit pin-out



Connector A (3-way)	
Pin	Description
1	Can H
2	+ 15 (+APC)
3	Can L

Connector B (2-way)	
Pin	Description
1	+30 (+ Batt)
2	Ground (GND)

Wiring diagram

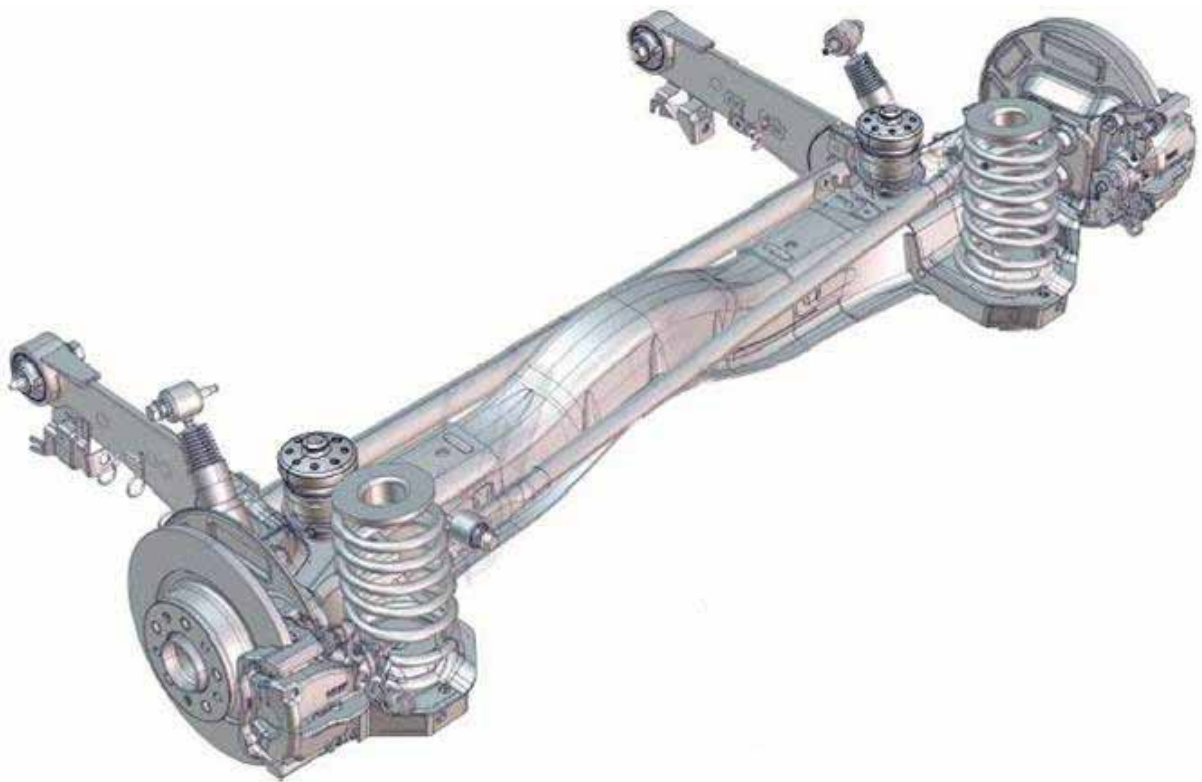


Wiring diagram key:

- 7122 : Power steering control unit (GEP)
- BSI : Body Computer (NBC)
- BB00 : BATTERY
- BFDB : Max fuses on the battery positive cable
- MFAV : Safety fuse
- CA00 : Ignition block
- C001 : DIAGNOSIS CONNECTOR
- CV00 : SWITCHOVER MODULE UNDER STEERING WHEEL (COM 2000)
- MC58 : Ground
- M000 : Battery ground
- PSF1 : SERVICES FUSE BOX PLATE

7. SUSPENSION SYSTEM

7.1 STANDARD REAR SUSPENSION SYSTEM

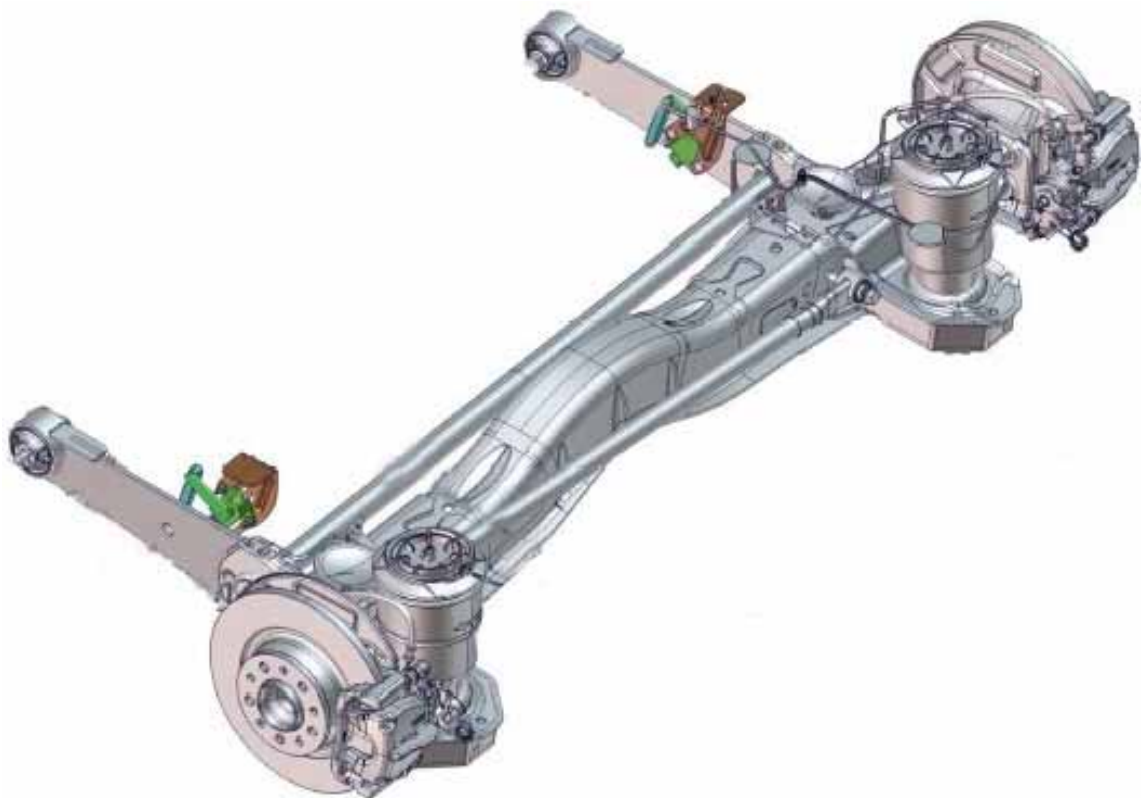


7.2 PNEUMATIC REAR SUSPENSION SYSTEM WHERE APPLICABLE

Description of the system

Most industrial vehicles are subjected to load constrictions for thousands of miles. This use generates mechanical stress on the suspension, reduction in drive, but above all it alters the vehicle's dynamic behaviour.

The air suspension remedies these drawbacks by allowing vehicles equipped with it to keep in good running trim no matter what load is transported.



The rear air suspension equips some versions shown in the following table:

	Van L1	Van L2	Combi L1	Combi L2	Combi L3
Rear air suspension	O	S	O	S	-
Rear air suspension with air reserve	O	S	O	O	S

The system can operate in the following modes:

- **Automatic** corrections, both lengthways and vertically, to bring the vehicle back into its reference trim (Fig. 2–3) on exceeding the speed of 10 Km/h
- **Manual** with two optional push-buttons (up/down) on the rear right-hand pillar, with the vehicle stationary (Fig. 1-2).

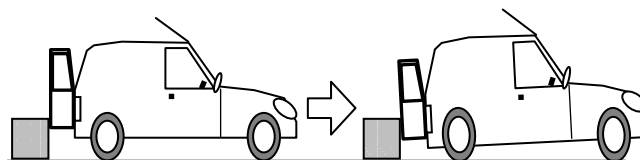


Fig. 1

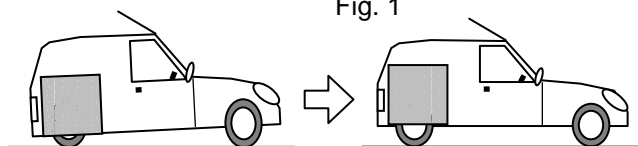


Fig. 2

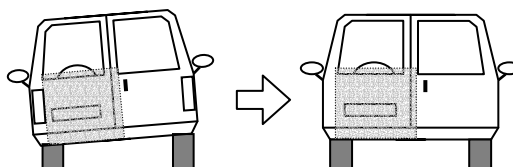


Fig. 3

In addition the system can interact with the ESP system, which constantly sends the suspension control unit the transverse acceleration and steering wheel angle, which prevents trim adjustment, in automatic mode, according to the following thresholds:

1] 0.5 g for speeds < 50Km/h

2] 0.2-0.3 g for speeds > 50Km/h

Beyond these thresholds the suspension control unit, on detecting a height difference (driver or passenger side) of the vehicle 4mm greater than the reference, activates correction to restore trim.

Suppliers

The system components are made by the following firms:

- Compressor : WABCO
- Control unit and Software: WABCO
- Pneumatic spring: Vibracoustic
- Air reserve tank: WABCO
- Pipes and couplings: MGI

System composition

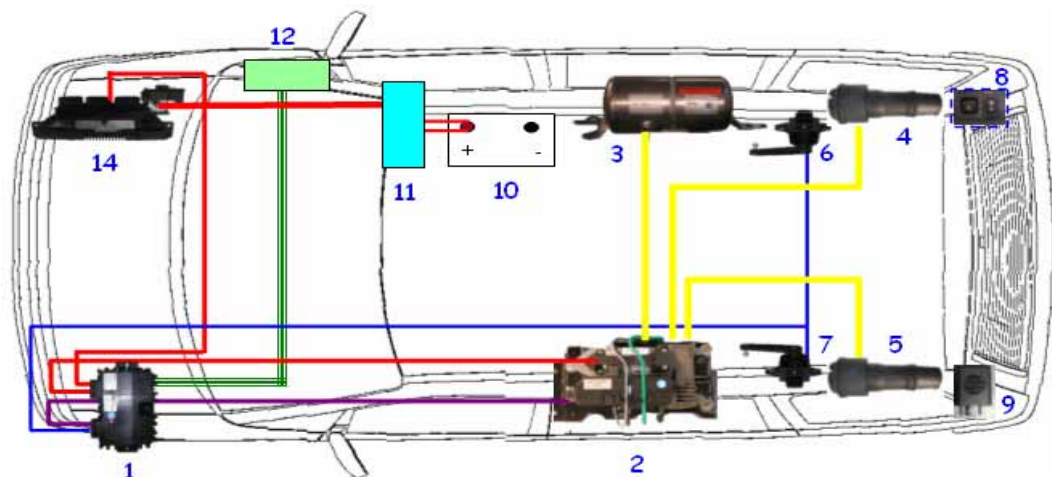
The rear air suspension with Adjustable Load Height is composed of:

Standard circuit:

- 1 System electronic control unit
- 2 Air springs
- 1 Compressor assembly / 3 solenoid valves
- 1 Pressure sensor
- 1 Compressor ambient air temperature sensor
- 2 Height sensors
- 1 Passenger compartment air intake filter
- 4 Air pipes
- 1 System failure and system inhibition warning light

Complete circuit:

- 1 Compressor assembly / 4 solenoid valves
- 1 Push-buttons / switch unit
- 1 Loading deck height variation inhibition warning light
- 1 Buzzer
- 1 Air reserve tank



Key:

- | | |
|----------------------------|---------------------------|
| 1. Electronic control unit | 8. Switch unit |
| 2. Compressor assembly | 9. Buzzer |
| 3. Air tank | 10. Battery |
| 4. Right air spring | 11. BFDB (fuses) |
| 5. Left air spring | 12. BSI (Body Computer) |
| 6. Right height sensors | 14. MFAV (fuses) |
| 7. Left height sensors | |

System electronic control unit

The system control unit is connected to the Can IS network and is located in the engine compartment near the left headlight.

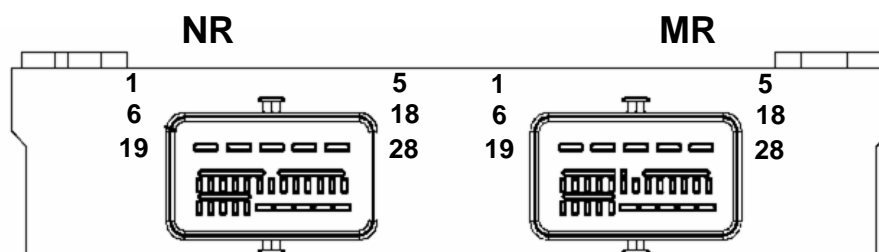


The electronic control unit, besides managing vehicle height control, ensures the system components receive the correct supply of electric power according to the following table:

Component	Power supply (Volt)
Left height sensor	5V
Right height sensor	5V
Pressure sensor	12V
Push-buttons (up/down)	12V
Inhibition switch	12V

Control Unit Pin Out

The control unit supplied by WABCO is fitted with two 28 pin connectors

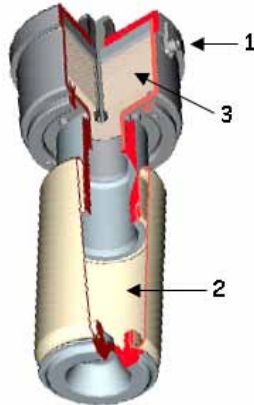


CONNECTOR (MR)	
Pin	Description
1	(+) Battery direct (B7715)
2	(+) Pump motor supply (787)
3	n.c.
4	(-) Pump motor ground (788)
5	(-) Control unit ground (M7715)
6	(+) Manual height reduction control (7707)
7	(+) Manual height increase control (7706)
8	(+) Push-button power supply (7870)
9 - 13	n.c.
14	(+) System inhibition button LED control (7890)
15 - 28	n.c.

CONNECTOR (NR)	
Pin	Description
1	(+) Compressor Solenoid Valve Power Supply (7880)
2	Left spring solenoid valve control (7882)
3	Right spring solenoid valve control (7881)
4	Air discharge solenoid valve control (7884)
5	Tank solenoid valve control (7877)
6	Can IS – H network (9000) connection with ABS
7	(-) Left height sensor ground (7741)
8	Can IS – H network (9010) connection with BSI
9	Left height sensor signal (7742)
10	(+) Left height sensor power supply (7740)
11	(+) Pressure sensor power supply (7885)
12	Pressure sensor signal (7887)
13	(-) Pressure sensor ground (7886)
14 - 15	n.c.
16	(+) Information on status of activity/wake-up of control unit - RCD (7842)
17	(+) Buzzer command (7780)
18	n.c.
19	Can IS – L network (9001) connection with ABS
20	(-) Right height sensor ground (7744)
21	Can IS – L network (9011) connection with BSI
22	Right height sensor signal (7745)
23	(+) Right height sensor power supply (7743)
24	(+) Electronic control unit power supply (BE771)
25	n.c.
26	(-) System inhibition manual control (7891)
27	Air temperature sensor signal (7888)
28	(-) Air temperature sensor ground (7889)

Air springs

There are two air springs used on the rear suspension and the air capacity of each cushion is 2.5 litres at a pressure of 4 bar.

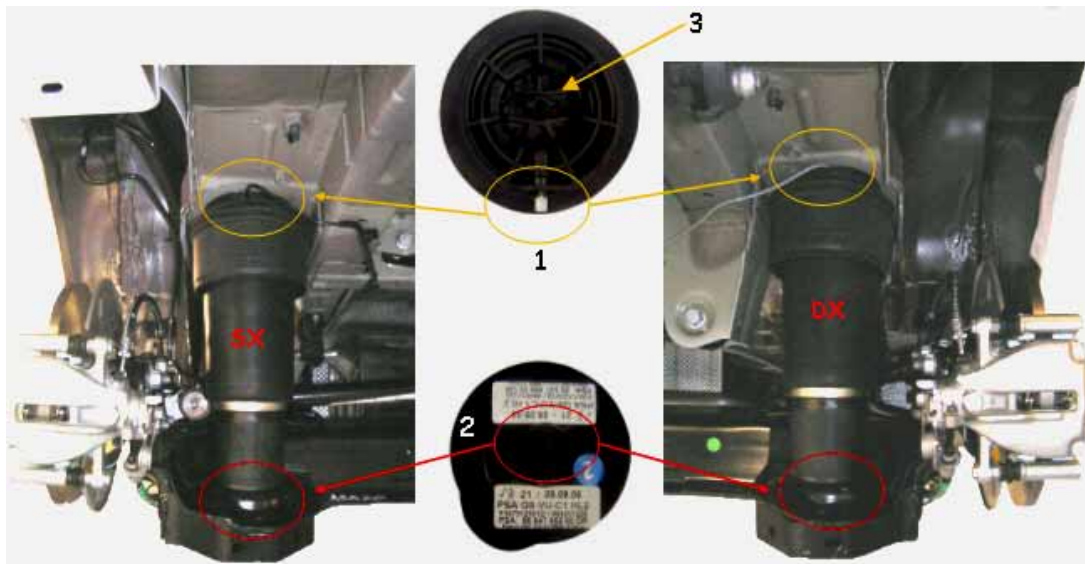


Key:

1. air coupling (in/out) - 2. air cushion - 3. cone

Location of air springs

The air springs are connected to the body by the top (3) and the bottom (2) to the arm of the suspension.



Key:

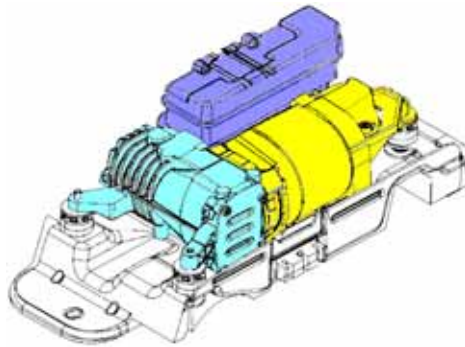
1. air coupling (in/out) - 2. bottom spring support – 3. top spring support

Compressor assembly

The compressor assembly is entirely enclosed in casing with no oil. Depending on whether there is an additional air tank, there are two versions:

- compressor assembly (with no additional air tank).
- compressor assembly (with additional air tank).

The compressor uses an air flow rate of 15 litres a minute.



The compressor assembly is composed of:

- 1 Piston
- 1 Air inlet single-acting valve (on the head of the piston)
- 1 Connecting rod (lubricated for life)
- 1 Cylinder
- 1 Electric motor
- 1 Granule air dehumidifier
- 1 Pressure sensor
- 1 Compressor ambient air temperature sensor
- 3 solenoid valves with no additional air tank or 4 solenoid valves with additional air tank

The compressor can be divided into 4 main sections:

- section (A): cylinder – piston (Fig. 1)
- section (B): electric motor (Fig. 1)
- section (C): solenoid valve unit (Fig. 1)
- section (D): dehumidifier unit (Fig. 2)

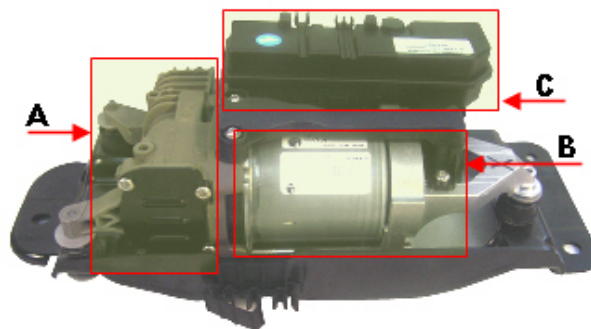


Fig. 1

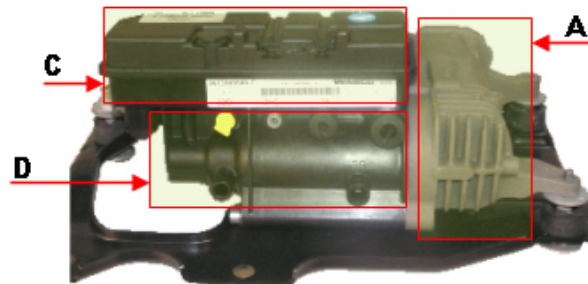


Fig. 2

Air pipe couplings on compressor assembly

The pump assembly is fitted with couplings for the related pipes.
The figure below shows the following:



1. air pipe coupling "RH air spring" (diameter 4 mm)
2. air pipe coupling "LH air spring" (diameter 4 mm)
3. pipe coupling "Additional tank" (diameter 6 mm)
4. pipe coupling "Air pump intake"(diameter 10 mm)

Compressor control management

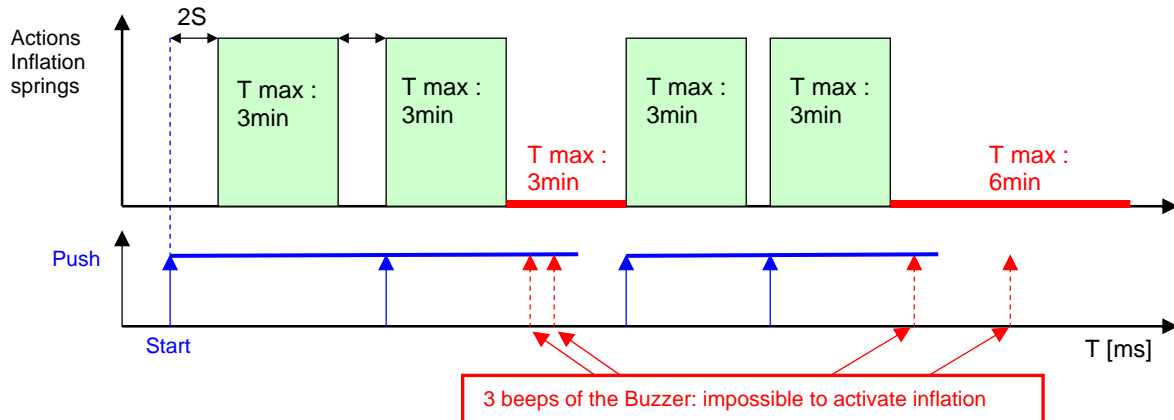
The time it takes for the compressor to switch on depends on the surrounding temperature of the compressor.

The compressor ambient air temperature, measured by a specific sensor, is sent to the air suspension control unit that, whenever the temperature exceeds the critical threshold, stops the operation of the compressor and solenoid valves.

This condition is saved as an error condition (95°C).

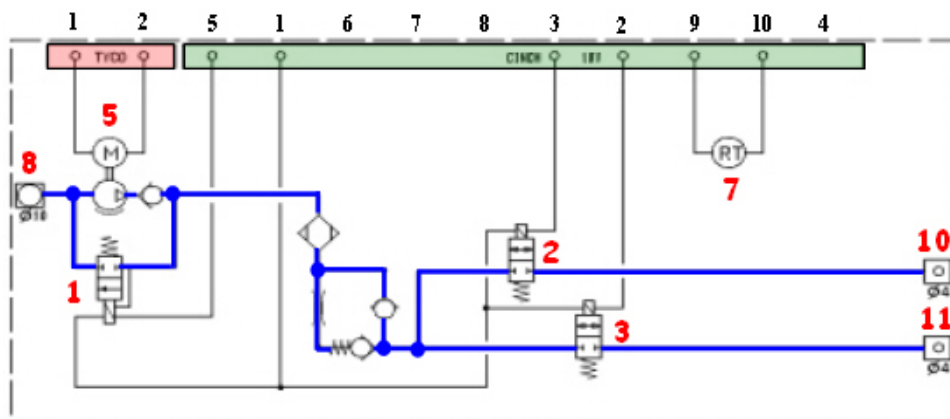
The compressor is switched back on when the temperature falls to a safe level after a time of 10 min.

The longest working time for the compressor is 3 min. The stoppage required between 2 uses is 3 min. It is doubled after another two cycles of operation. During the phase of stopping the compressor the control unit inhibits any request for moving the loading deck, signalling it with an audible warning.



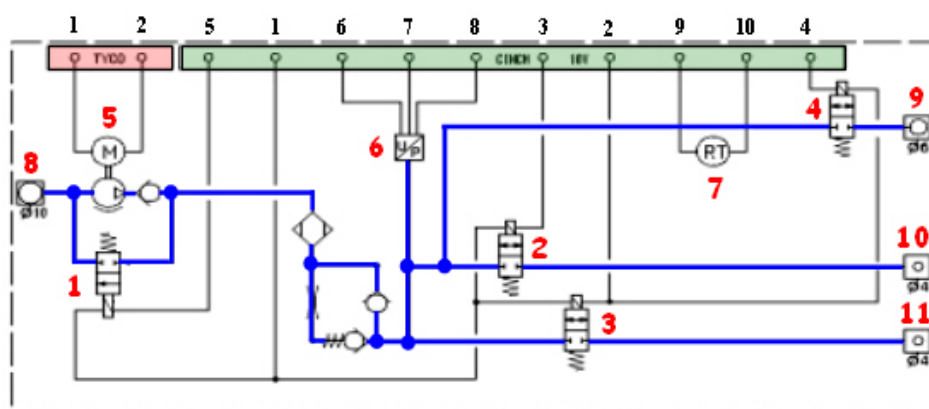
Functional diagram of compressor without air reserve

The diagram below shows the electric connections and air lines inside the compressor for the system without an air reserve tank.



Functional diagram of compressor with air reserve

The diagram below shows the electric connections and air lines inside the compressor for the system with an air reserve tank.



Functional diagrams key:

1. Air discharge solenoid valve
2. Left air spring solenoid valve
3. Right air spring solenoid valve
4. Air reserve tank solenoid valve (*)
5. Compressor motor
6. Pressure sensor (*)
7. Compressor ambient air temperature sensor
8. Air inlet
9. Outlet for air reserve tank (*)
10. Air outlet for left air spring
11. Air outlet for right air spring

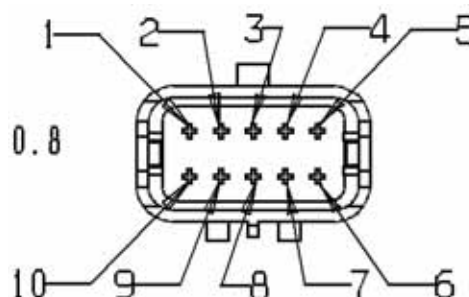
Note: (*) : Specific component for system with air reserve

Compressor assembly Pin Out with and without air reserve

CONNECTOR A (NR)		
Pin	Wire	Info
1	788	(-) Pump motor ground
2	787	(+) Pump motor supply



CONNECTOR B (NR)		
Pin	Wire	Info
1	7880	(+) Solenoid valve power supply
2	7881	Right spring solenoid valve control
3	7882	Left spring solenoid valve control
4	7877	Tank solenoid valve control (*)
5	7884	Air discharge solenoid valve control
6	7885	(+) Pressure sensor power supply
7	7886	(-) Pressure sensor ground (*)
8	7887	Pressure sensor signal (*)
9	7888	Air temperature sensor signal
10	7889	(-) Air temperature sensor ground



Note: (*) : Function only present for system with air reserve

Height sensors

Two height sensors are fitted (output signal in PWM) for both the right and left sides of the vehicle.



A height difference ($> 4\text{mm}$) signalled by the related right and left sensors causes a correction operation to bring the vehicle back into its reference trim.

Besides providing information on the height of the vehicle, the sensors allow the control unit to check blocking during the movement (anti-crushing function). In effect, if the sensors detect blockage of the movement of one or both shock absorbers up or down, the system blocks and moves back by 3mm.

For the system to work properly, these sensors need calibration with the aid of the diagnosis instrument.

Location height sensors

The height sensors are connected between the body and the right and left oscillating arm of the suspension, as shown in the figures below:



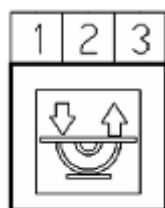
Left height sensor



Right height sensor

Height sensors Pin Out

The following tables show the electric connections between the sensor and electronic control unit of the air suspensions:



Pin 1 = (+) Power supply

Pin 2 = Signal (PWM)

Pin 3 = Ground

Left height sensor 7753	
Sensor	Control unit
pin	pin
1	NR 10
2	NR 9
3	NR 7

Right height sensor 7754	
Sensor	Control unit
pin	pin
1	NR 23
2	NR 22
3	NR 20

Height sensor characteristics

Angle of measurement: $\pm 45^\circ$

Power supply voltage: 5 V \pm 0.25 V

Input current: < 15 mA

Working temperature: from - 40° C to +125° C

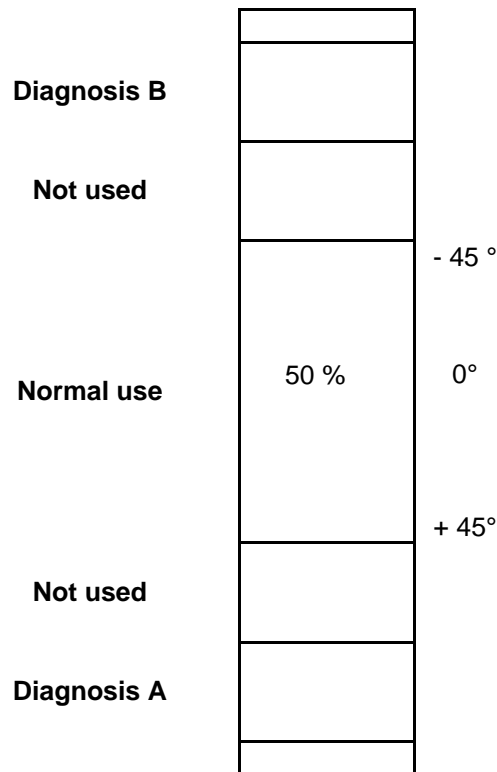
Output signal: PWM at 200 Hz \pm 25 Hz

PWM use: from 12.5%(+45°) to 87%(-45°)

Support tightening torque: 8 NM \pm 25%

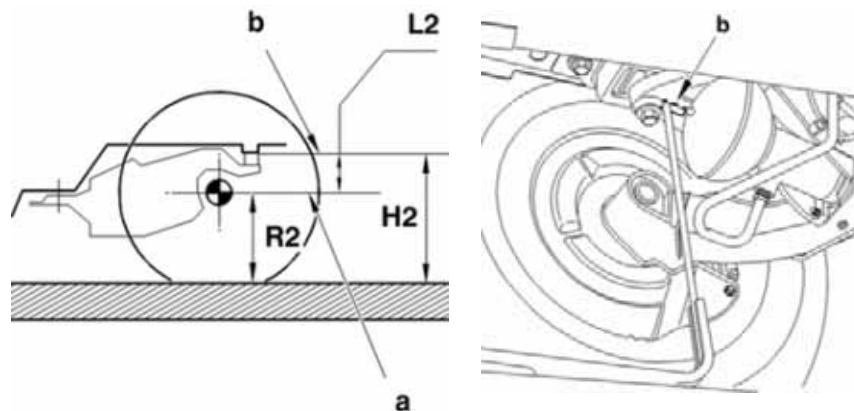
Graph

The following graph shows the correspondence between the angular position of the movable arm of the sensor and the corresponding PWM percentage.



The 0° position corresponding to a PWM signal with Duty Cycle of 50%. The zero position is obtained by resetting with the diagnosis instrument. This trim will be considered by the control unit as the reference for future corrections.

Reference trim is used to mean the distance between the wheel centre and the body.



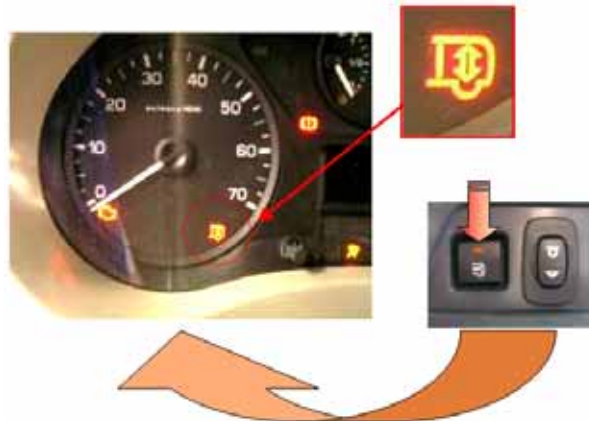
Key :

- a. wheel axis centre
- b. Reference on vehicle body
- R 2. Wheel axis centre height
- L 2. Vehicle reference height
- H 2. Body height

Push-buttons/switch unit

The push-buttons/switch unit, fitted only in the configuration with an additional air tank, enables lowering the vehicle manually to facilitate goods loading and unloading operations.

To turn off the system you need to keep the button pressed until an audible warning is emitted. Turning off is confirmed by a subsequent double audible warning and by the LED on the button lighting up. After turning off the system, to switch it back on (solely with the vehicle stationary) keep the button pressed until an audible warning is emitted. Turning back on again is confirmed by a subsequent double audible warning and by the LED on the button lighting up.



- The push-buttons have 3 operating states: up / neutral /down plus audible feedback during the handling operation.
- The switch has two operating states: On - Off

Automatic trim return to the Rated or reference setting after using the down/up buttons is envisaged:

1. By briefly double pressing the opposite button to the manoeuvre carried out.
2. 10 seconds after closing the loading area.
3. When the vehicle speed exceeds the parking speed (10 Km/h).

Location of the push-buttons/switch unit

The push-buttons/switch unit is located on the rear right pillar



Key:

1. System inhibition switch – 2. Up button – 3. Down button

Switch/push-buttons unit Pin Out

The following tables show the electric connections: between the switch/push-buttons unit and the electronic control unit of the air suspensions:

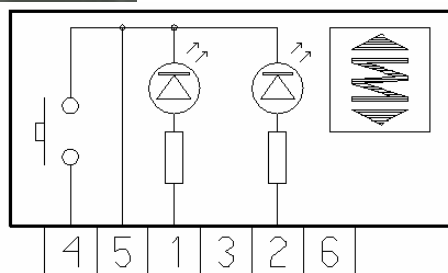
System inhibition switch connector

Pin 2 : (+) System inhibition switch LED power supply

Pin 4: (-) System inhibition manual control

Pin 5: Ground

Inhibition switch - 7738	
Conn. Switch	Control unit
pin	pin
1	n.c.
2	MR 14
3	n.c.
4	NR 26
5	Ext. Ground
6	n.c.



Up/down control request connector

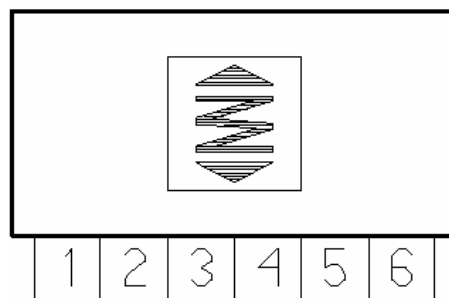
Pin 2: (+) Push-button power supply

Pin 3: (+) Manual height increase control

Pin 4: (+) Push-button LED power supply

Pin 6: (+) Manual height reduction control

Down/up buttons - 7749	
Conn. Push-buttons	Control unit
pin	pin
1	
2	MR 8
3	MR 7
4	?
5	
6	MR 6



Buzzer

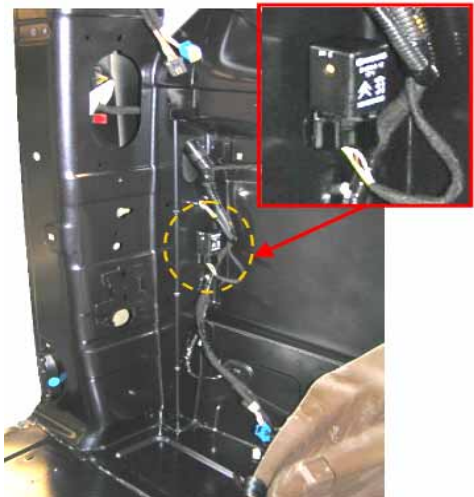
The buzzer beeps when changing the height of the loading deck.



Correction Mode	User Action	Emission condition	Buzzer sound		
			OFF	CONTINUOUS	DISCONTINUOUS
Automatic		vehicle speed > 10 Km/h, corrections are prevented		X	
		Default Mode			X
Manual	Keep pressing the push-button (up-down) for 2 sec. under conditions of upper and lower max trim	Corrections are prevented		X	
	Pressing the push-button (up-down)	As long as the system is running until a software stop is reached.			X
		When the software stop is reached, as the system stops.	X		
		If the software stop is reached, when again pressing the button to pass by it.			X
		Reference trim reached: interruption in correction, even if the tilter is kept pressed.	X		
		Return to the reference trim: double pressing the button in the opposite direction to the position reached.			X
		If the manual control is deactivated (due to a fault or if the electronic management deactivates it,...)			

Location of the buzzer

The buzzer is fitted behind the covering of the rear left pillar



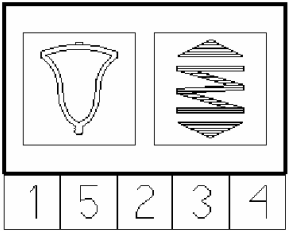
Buzzer Pin Out

The following tables show the electric connections: between the Buzzer and electronic control unit of the air suspensions:

Buzzer connector

- Pin 1: (+) Buzzer command
- Pin 2: (+) Buzzer command
- Pin 5: (-) Ground

Buzzer - 7769			
Buzzer		Control unit	
pin	info	pin	info
1	7780	NR 17	7780
2	7780	NR 17	7780
3	n.c.		
4	n.c.		
5	M776B		



Air reserve tank (additional)

The additional air tank is only present when the customer has chosen to install the option of manually changing the height of the loading deck.
The tank has a capacity of 5 litres of air with pressure from 15 to 20 bar max.

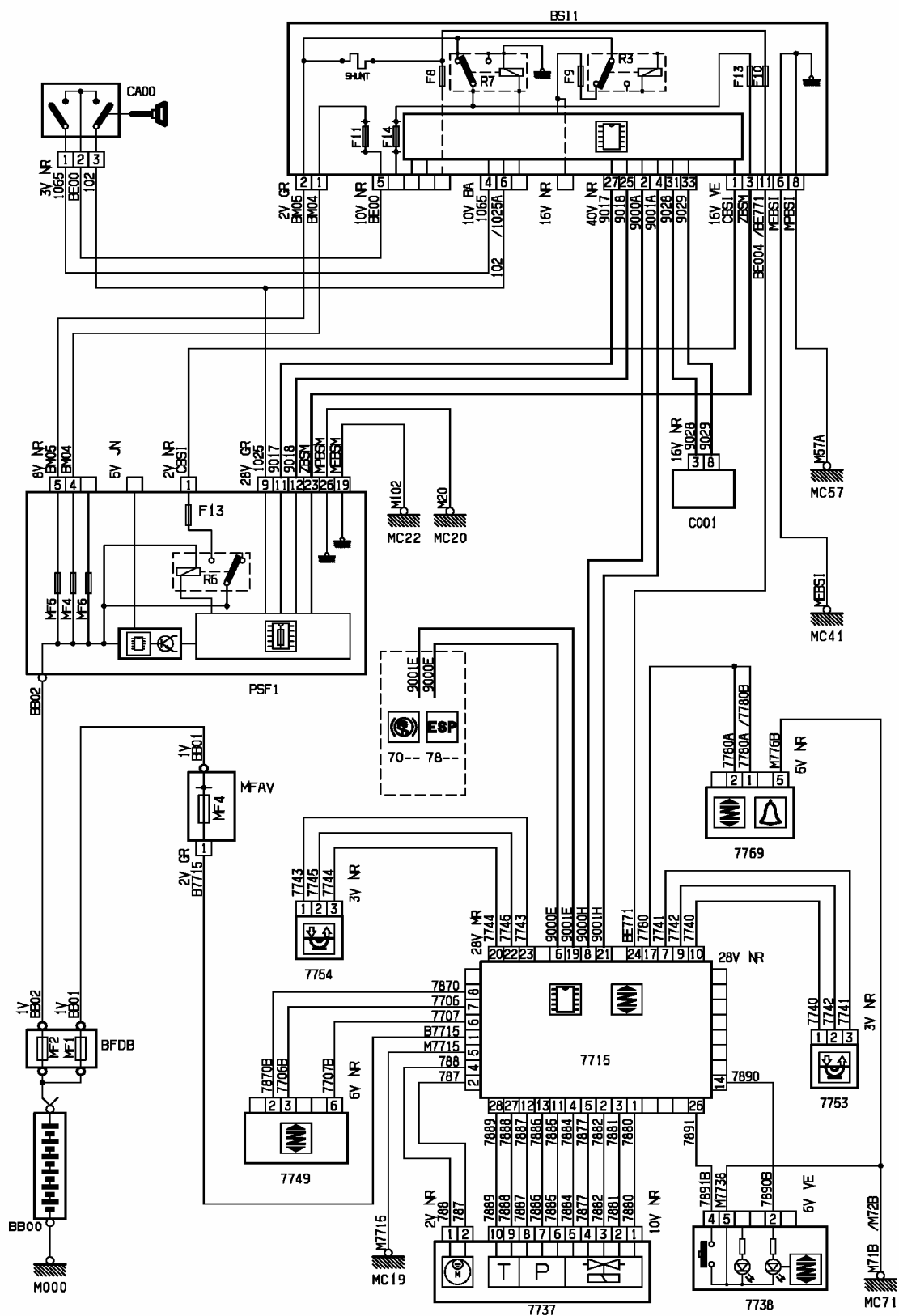
Warning: If removing and refitting the tank, first start the system pressure discharge procedure.



Key:

- 1. Air pipe coupling of 6 mm

Wiring diagram of electric system with air reserve



System wiring diagram key:

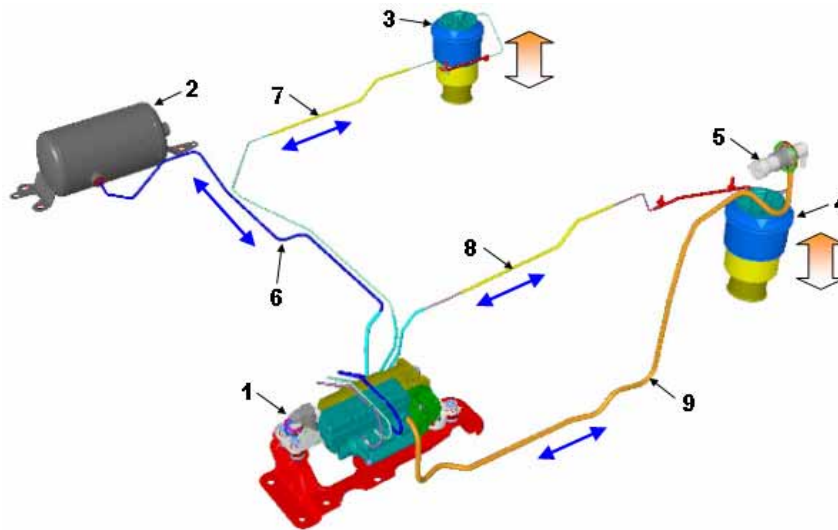
7715: Air suspension control unit
7737: Compressor assembly
7738: System inhibition button
7749: Loading deck height variation manual control assembly
7753: Left height sensor
7754: Right height sensor
7769: Buzzer
C001: Diagnosis socket
BB00: Battery
CA00: Ignition block
BSI : Body Computer
BFDB: Fuses on the battery positive pole
MFAV: Junction unit
PSF1: Junction unit
MCxx: Grounding points on the body

Air circuit and pipes

Depending on the vehicle (short or long wheelbase), the air circuit pipes can be of different sizes to adapt to the length of the vehicle.

If performing maintenance on the pipes (7), (8) and on the air springs (3), (4) take care over the following pressures:

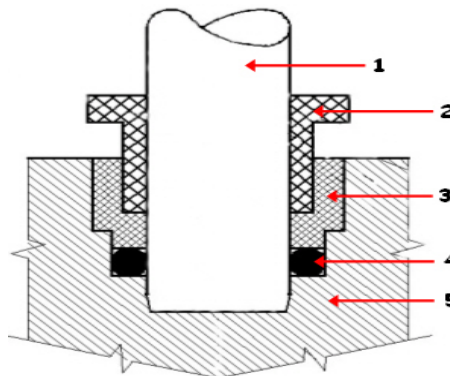
- 2 bar : minimum operating pressure (spring discharged)
- 4 bar : max operating pressure (spring charged)
- 15-20 Bar : air reserve tank



Key:

- | | |
|---|--|
| 1. Pump assembly | 7. Piping between pump assembly and right air spring |
| 2. Additional tank | 8. Piping between pump assembly and left air spring |
| 3. Right air spring | 9. Piping between pump assembly and air filter |
| 4. Left air spring | |
| 5. Passenger compartment air intake filter | |
| 6. Piping between pump assembly and additional tank | |

The impermeability/seal between the pipes and couplings is made with a joint with an O-Ring.

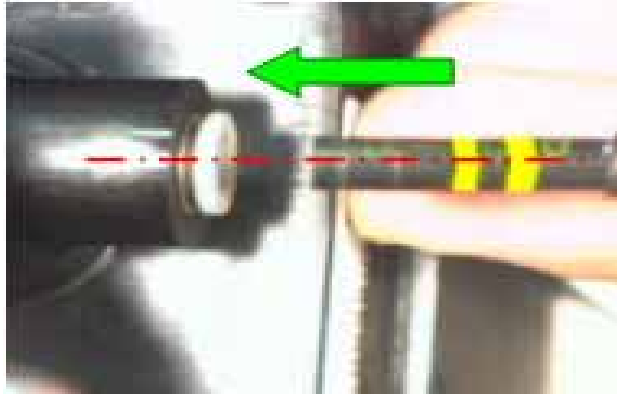


Key: 1. Pipe – 2. safety ring – 3. Pipe support – 4. O-Ring – 5. Component

Procedure for removing and refitting pipes

Fitting pipes

The pipe assembly operations need no specific equipment, just insert the pipe into the coupling, keeping it in axis with the coupling, as far as the second yellow position ring:



Note: Any counter-traction will confirm correct pipe fitting.

Warning: Any buckling in the pipe in the splining zone will cause a leak in the pneumatic system. Before assembly then check there are none of the following defects in the pipe fitting:

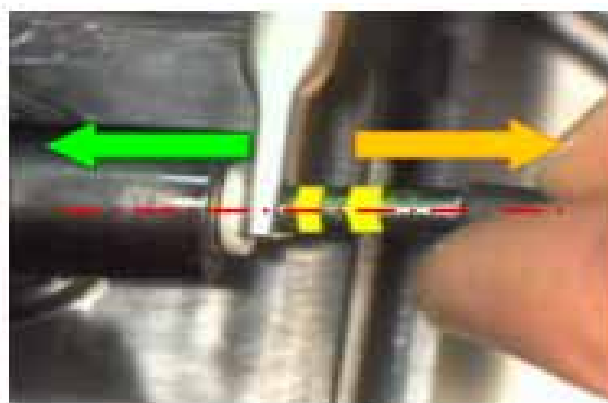
- choking
- crushing
- scoring

Pipe disassembly

The pipe disassembly operations need specific equipment for:

- Air spring pipe diameter \varnothing 4
- Air reserve tank pipe diameter \varnothing 6
- Air intake and exhaust pipe diameter \varnothing 10

that aids the pressure on the safety ring of the coupling.



Note: When extracting the pipe, keep it in line with the coupling

Air circuit functional diagram

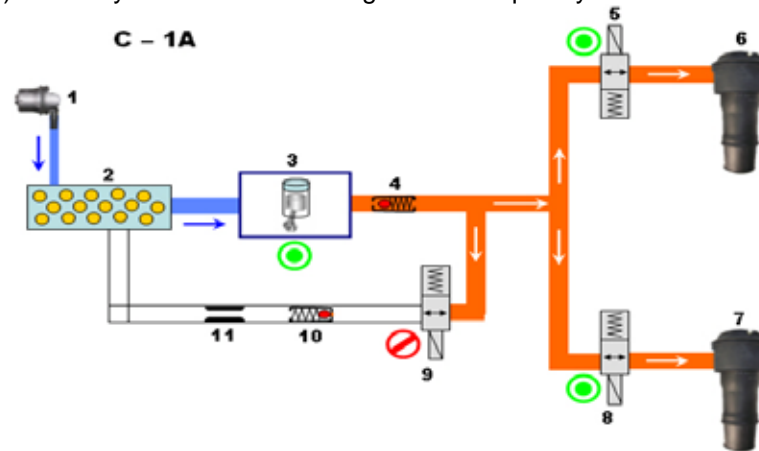
Pneumatic circuit without air reserve tank

Increase in the height of the loading deck

Figure (C – 1A) shows the automatic/manual loading deck adjustment operation (height increase) using the air springs (6) and (7).

The air drawn into the circuit initially passes through the passenger compartment air filter (1) and then through the dehydrator filter (2) to remove any traces of moisture. By compressing the air, the compressor raises the pressure in the circuit, making the mechanical single-acting valve open (4). In the meantime the electronic control unit, with an electric signal, keeps the solenoid valves (5) and (8) open, simultaneously or singly depending on the signals received from the height sensors.

To prevent dangerous kickbacks in the air circuit when switching on the air compressor, the solenoid valve (9) is initially modulated with a signal at a frequency of 400 MHz.

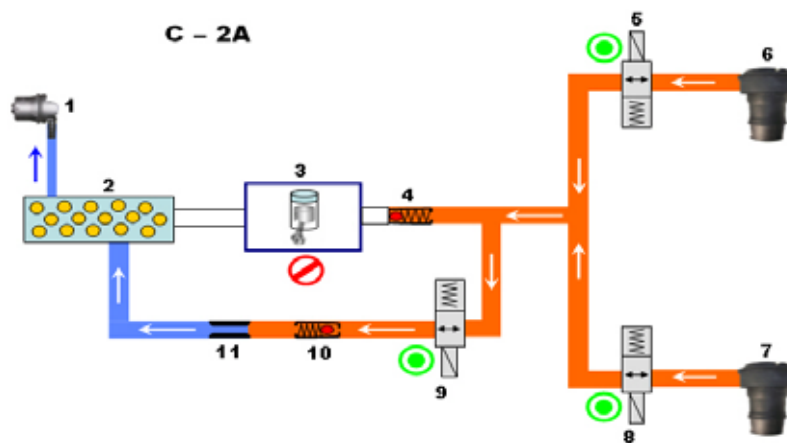


Reduction in height of the loading deck

Figure (C – 2A) shows the automatic/manual loading deck adjustment operation (height decrease) using the air springs (6) and (7).

The electronic control unit, with an electric signal, initially keeps the solenoid valves (5) and (8) open; simultaneously or singly depending on the signals received from the height sensors and afterwards it commands the solenoid valve (9) to discharge the circuit and thereby lower the vehicle.

With the solenoid valve (9) open, the air passes through the mechanical single-acting valve (10) and the choke in pipe (11) to then reach the dehydrating filter (2) and the air filter (1).



Key Figure C-1A and C-2B:

- | | |
|-------------------------------------|------------------------------------|
| 1. Air filter | 7. Left air spring. |
| 2. Dehydrating filter | 8. Left air spring solenoid valve. |
| 3. Air compressor | valve. |
| 4. Mechanical single-acting valve | 9. Air discharge solenoid valves |
| 5. Right air spring solenoid valve. | 10. Mechanical single-acting valve |
| 6. Right air spring. | 11. Air pipe reduced cross-section |

Pneumatic circuit with air reserve tank

The basic difference with the standard circuit is that there are the following components:

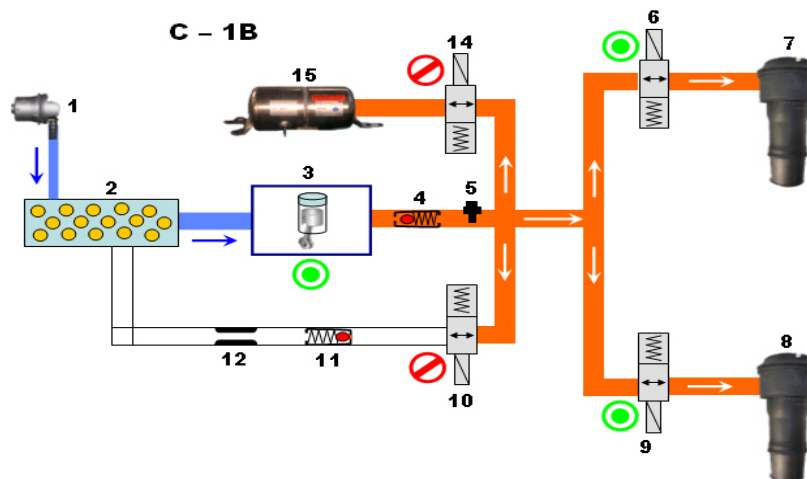
- of the solenoid valve (14)
- air reserve tank (15)
- Pressure sensor (5)

Increase in the height of the loading deck

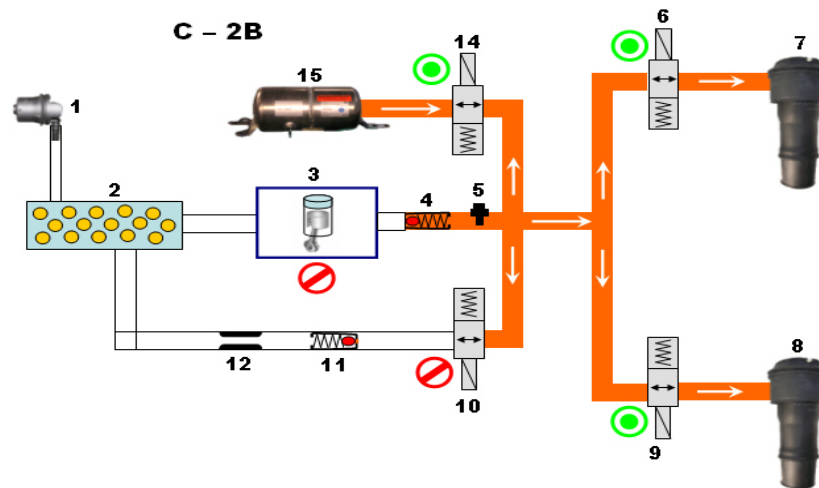
Figure (C-1B e C-2B) shows the automatic or manual loading deck adjustment operation (height increase and decrease) using the air springs (7) and (8).

This operation can be performed in two ways:

- with the aid of the compressor (3) when the reserve in the tank (15) is not sufficient. See figure C1-B.



- with the aid of the air reserve in the tank (15) by means of the solenoid valve command (14).
See figure C2-B

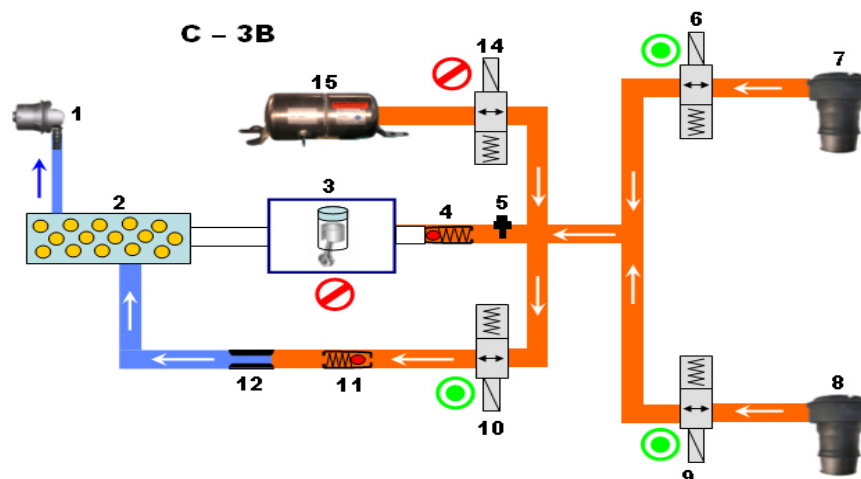


Reduction in height of the loading deck

Figure (C – 3B) shows the automatic or manual loading deck adjustment operation (height reduction) using the air springs (7) and (8).

The electronic control unit, with an electric signal, initially keeps the solenoid valves (6) and (9) open; simultaneously or singly depending on the signals received from the height sensors and afterwards it commands the solenoid valve (10) to discharge the circuit and thereby lower the vehicle.

With the solenoid valve (10) open, the air passes through the mechanical single-acting valve (11) and the choke in pipe (12) to then reach the dehydrating filter (2) and the air filter (1).



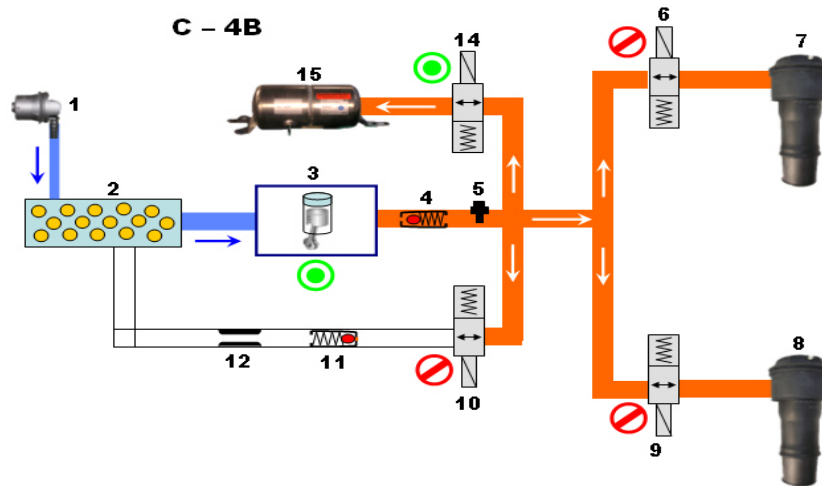
Recharging the air reserve tank

(Figure C – 4B) shows the procedure for restoring the air reserve in the tank (15).

The control unit checks the signal of the pressure sensor (5) with the solenoid valves (6), (9) and (10) closed and the solenoid valve (14) open.

If the pressure is lower than 15 bar the control unit activates the compressor to restore the pressure of 20 bar. In these conditions it closes the solenoid valve (14).

To prevent dangerous kickbacks in the air circuit when switching on the air compressor, the solenoid valve (10) is initially modulated with a signal at a frequency of 400 MHz.



Key Figure C-1B, C-2B , C-3B, C-4B :

- | | |
|--|------------------------------------|
| 1. Air filter | 8. Left air spring. |
| 2. Dehydrating filter | 9. Left air spring solenoid valve. |
| 3. Air compressor | 10. Air discharge solenoid valve |
| 4. Mechanical single-acting valve | 11. Mechanical single-acting valve |
| 5. Air pressure and temperature sensor | 12. Air pipe reduced cross-section |
| 6. Right air spring solenoid valve. | 14. Air reserve solenoid valve |
| 7. Right air spring. | 15. air reserve tank |

8. ELECTRIC SYSTEM

8.1 GENERAL

Power supplies

The vehicle has the following power supplies:

- ✓ Power supply "+ ACCESSORIES (+ACC)"
- ✓ Power supply "+ CONTACT KEY (+APC)" Literally power supply after contact **Apres Conatct**) Power supply with key on drive distributed by the Body Computer Node
- ✓ Power supply "+ CONTACT KEY (+APC)" (as above) distributed by the Engine Compartment Junction Node
- ✓ Power supply "+ BATTERY" interrupted in park mode (+BAT-MP)
- ✓ Power supply "+ BATTERY" permanent (+BAT)
- ✓ Power supply "+ CAN"
- ✓ Control "+ RCD" (literally remote controlled wake-up), function of the Body Computer Node to activate the CAN network in advance to manage some functions of the Engine Control Node and Air Pressure Control Node)

The electric supply of the various vehicle systems depends on need and can be:

- ✓ permanent
- ✓ when the Body Computer Node wakes up

The Body Computer Node wake-up can be due to:

- an action on the remote control.
- opening a door.
- an action of + RCD (without turning the key onto the drive position).

LESTAGE (load activation) DELESTAGE (load deactivation) of the electric network

Lestage and **Delestage** are only possible with the alternator in its operating state and the combustion engine running

Lestage enables increasing the combustion engine temperature more quickly in order to improve the reconditioning of the FAP particulate filter on diesel vehicles.

Increasing the resistant torque of the alternator increases the torque of the combustion engine and, as a result, the temperature of the combustion engine too.

The Body Computer Node recognizes a **lestage** request from the Engine Control Node and forces activation of some electric charges. During this phase the driver is not told of the activation of the loads

Delestage if the engine is running and there is an extended imbalance of the electric balance the operation of some large services will momentarily be prevented.

Example: The Body Computer Node deactivates the activated loads for reconditioning the FAP.

Vehicle configuration

PARC mode

This configuration is used for vehicle storage



It enables not powering some large services directly from the permanent battery +BAT and therefore decreasing the energy consumption in order to ensure engine starting.

The +BAT supply shunt is moved into the “**Shunt Parc**” position so as to permit a power supply +APC

*Note: The “**Shunt Parc**” configuration permits access to the vehicle. (the door and boot locks are operative*

Customer Mode

This is the vehicle operating mode when it is delivered to the customer

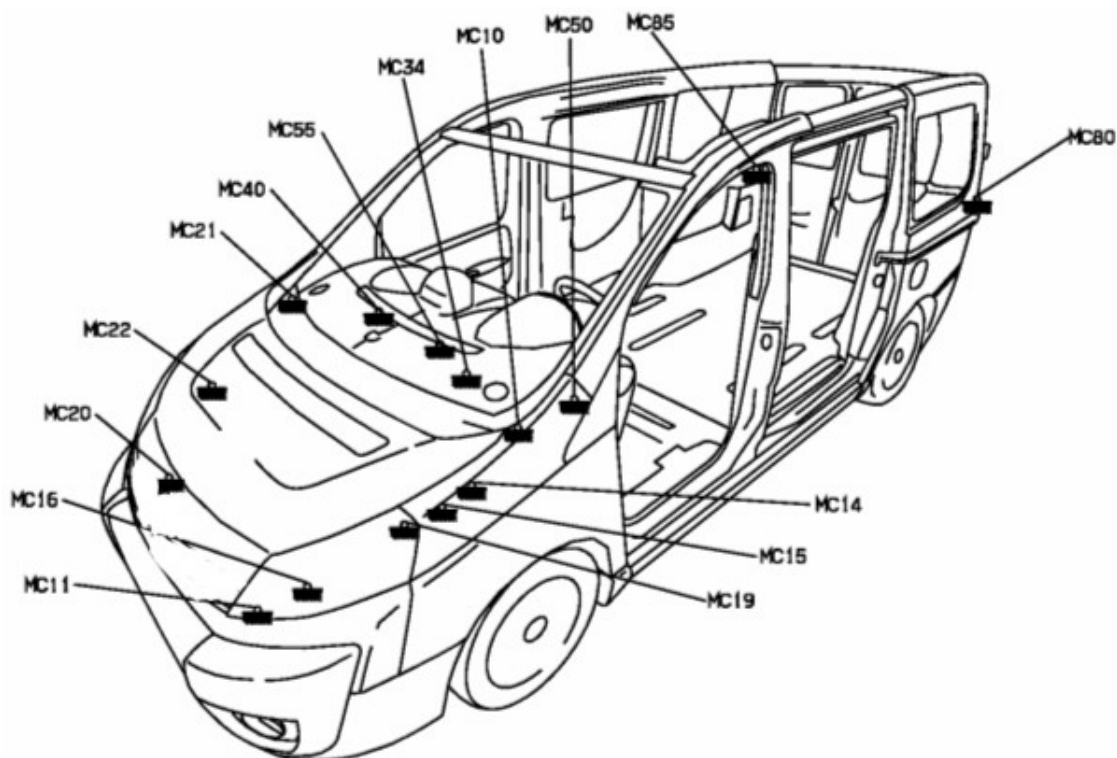
The customer mode corresponds to normal operation

The customer mode is activated after performing the following actions:

change the shunt parc position into the customer position on the Body Computer Node

General layout Vehicle weights

The layout below highlights the locations of the various weights located in the vehicle.



Key:

- | | |
|-----------------------------------|--|
| - M000 : Body weight | - MC22 : |
| - MC10 : Front left side weights | - MC34 : instrument panel cross member weights - left |
| - MC11 : Front left weights | - MC40 : instrument panel cross member weights - right |
| - MC14 : Front left side weights | - MC50 : front seat floor weights |
| - MC15 : | - MC55 : front right floor weights |
| - MC16 : Front left weights | - MC80 : rear left pillar weights |
| - MC19 : Front left side weights | - MC85 : rear right pillar weights |
| - MC20 : Front right weights | |
| - MC21 : Front right side weights | |



Multiplexing architecture

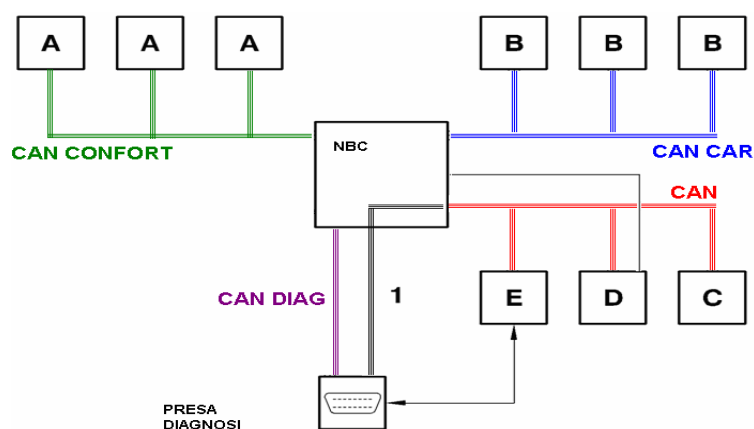
General

The vehicle's electric/electronic architecture enables the following performance:

- communication and operation of the different system elements
- diagnosis
- reprogramming the control units.

The electric architecture is composed of the following communication networks:

- CAN network (HS IS) (500Kbit/s) relating to the set of control units on the engine assembly
- CAN CAR network (LS) (125Kbit/s) relating to the safety systems
- CAN CONFORT network (LS) (125Kbit/s) relating to the human/machine interface
- CAN diagnosis socket



principal diagram key

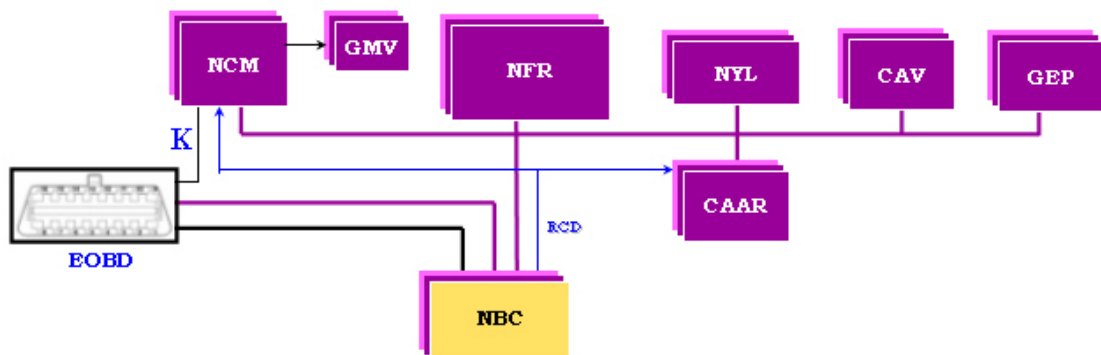
- Two-way arrows K diagnosis line
- Multiplexed network triple lines
- Single remote wake-up control line



CAN HS IS NETWORK

The CAN network (HS IS) is equipped for message transmission speeds of **500Kbit/s** (High Speed) and is composed of the following control units:

- NBC (Body Computer Node)
- NCM (Engine control unit node)
- NFR (Brake control unit Node)
- CAV (Steering Angle Node)
- GEP (Electro-hydraulic steering node)
- CAAR (Rear air suspension control unit node)
- NYL (Yaw sensor node for ESP)
- EOBD (diagnosis socket)
- GMV (engine cooling fan assembly)



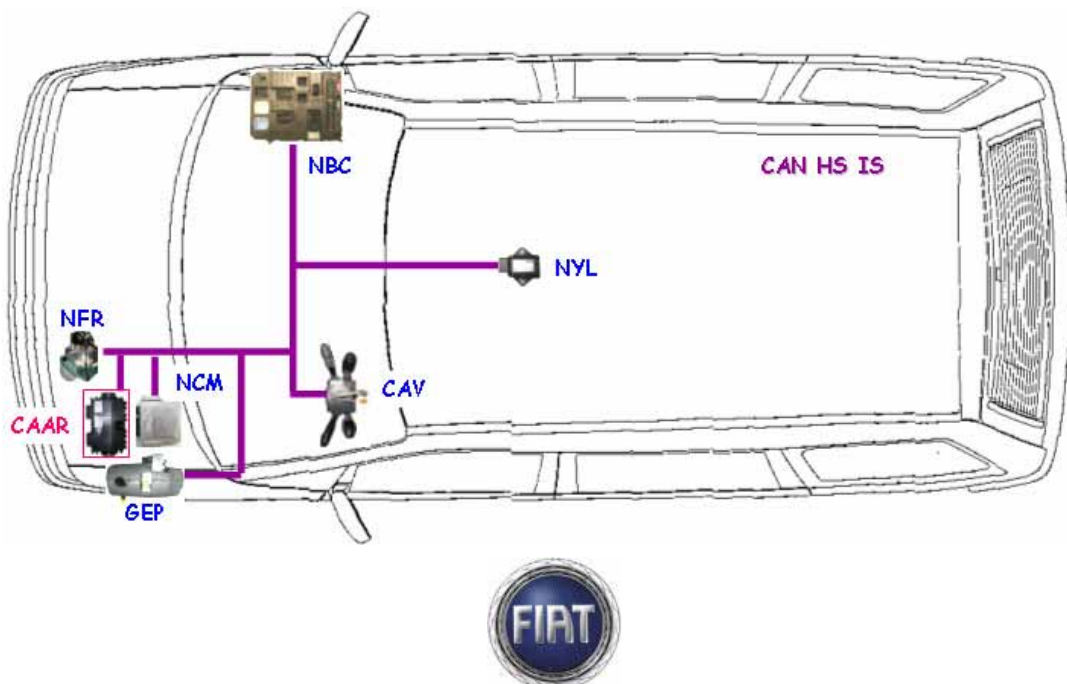
The CAN network is the multi-master type so all the control units transmit their messages within the network and these messages are read by the control units according to their use.

Some nodes are connected to the remote control wake-up line (RDC) that permits early wake-up.

NOTE Cutting a cable in the CAN network (CAN High) or (CAN Low) does not allow network communication

Control unit location related to the CAN HS IS network

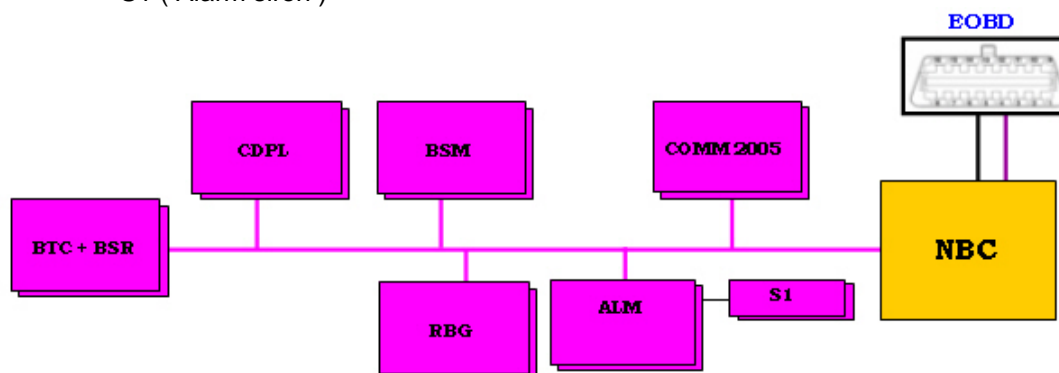
The following layout shows the location of the control units related to the CAN HS IS network



CAN LS CAR NETWORK

The CAN LS CAR network is equipped for message transmission speeds of **125 Kbit/s** (Low Speed) and is composed of the following control units:

- NBC (Body Computer Node)
- EOBD (diagnosis socket)
- COMM 2005 (Stalk Unit Node)
- ALM (Alarm Node)
- RBG (Air Bag Node)
- BSM (engine compartment junction node)
- CDPL (photocell and rain sensor node)
- BTC (bodywork conversion control unit node) integrates also the BSR (trailer control unit)
- S1 (Alarm siren)



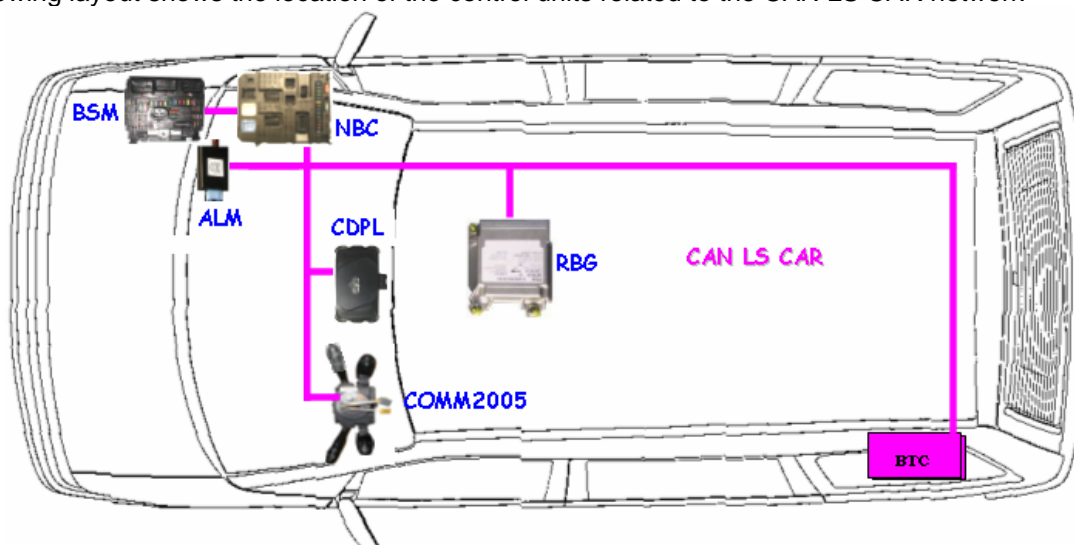
The Body Computer Node manages communication in the network and the +CAN power supply.

I Nodes in the CAN CAR network have their termination resistors and are powered depending on the case by +CAN, +BAT or +APC via the NDVM

NOTE Cutting a cable in the CAN network (CAN High) or (CAN Low) or a short circuit between the cables permits network communication, with error information.

Control unit location related to the CAN LS CAR network

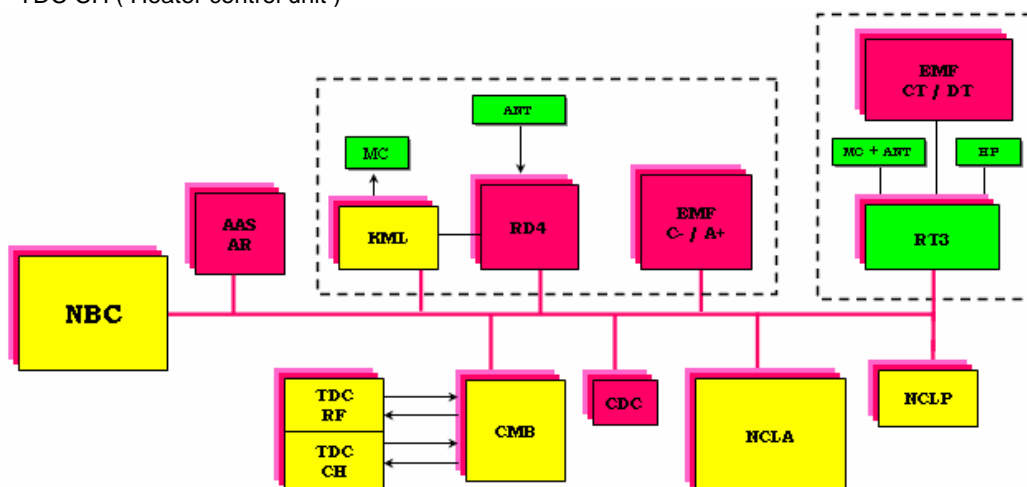
The following layout shows the location of the control units related to the CAN LS CAR network



CAN LS CONFORT NETWORK

The CAN LS CONFORT network is equipped for message transmission speeds of **125 Kbit/s** (Low Speed) and is composed of the following control units:

- NBC (Body Computer Node)
- AAS (rear parking sensors node)
- KML (Hands-free kit node – Bluetooth)
- RD4 (Receiver Radio node)
- EMF (Multifunction screen node)
- RT3 (Satellite Navigator node)
- NCLP (Rear A/C node)
- NCLA (Front A/C node)
- CDC (CD Changer Node)
- CMB (instrument panel node)
- TDC RF (Manual A/C control unit)
- TDC CH (Heater control unit)

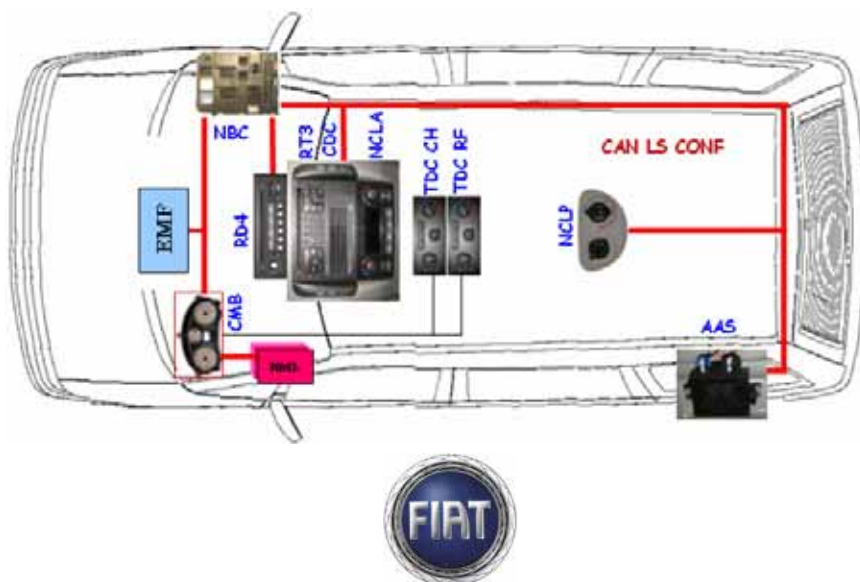


The Body Computer Node manages communication in the network and the +CAN power supply. The control units of the CAN CAR network have their termination resistors and are powered depending on the case by +CAN, +BAT or +APC via the NDVM.

NOTE Cutting a cable in the CAN CONFORT High or CAN CONFORT Low network or a short circuit between the cables permits network communication, with error information.

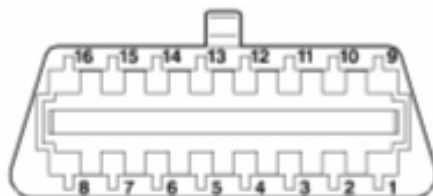
Control unit location related to the CAN LS CONFORT network

The following layout shows the location of the control units related to the CAN LS CONFORT network



Diagnostics socket

The diagnostics socket permits connecting the diagnosis instrument (Examiner) to the vehicle and dialoguing with all the control units equipped with auto-diagnosis.



The diagnosis socket is a 16-way connector

PIN	Signals
1	+APC
2	N.C.
3	CAN DIAGNOSTICS (High)
4	Tester ground
5	Signal ground
6	CAN (high)
7	K line for the automatic transmission and engine control unit
8	CAN DIAGNOSTICS (Low)
9	N.C.
10	N.C.
11	N.C.
12	Control unit K line of the CAN lines
13	K lines of the control units not connected to any network
14	CAN (Low)
15	N.C.
16	+ Battery

CAN DIAGNOSTICS NETWORK

The transmission speed of the CAN DIAGNOSTICS network is 500 Kb/s.

The CAN DIAGNOSTICS network permits:

- diagnosis of the control units on the CAN, CAN CAR, and CAN CONFORT network.
- the CAN DIAGNOSTICS network replaces the old K line and permits dialoguing more easily with the various control units
- accessing the necessary information for the EOBD standard (European On Board Diagnostic) making it possible to check the anti-pollution information.

Note: Not all the control units in the CAN network can be diagnosed via CAN DIAGNOSTICS, so they will keep the old K line

The CAN DIAGNOSTICS network permits uploading the programs to the control units of the CAN CAR, CAN CONFORT network and Body Computer Node

Note: This line at the diagnosis level is not used by Examiner.



K diagnosis line

The transmission speed of the K line is 10400 bauds

The K diagnostics line permits:

- diagnosing the errors on the control units of the CAN network not transmitted by the CAN DIAGNOSTICS network
- retrieving the necessary information for the EOBD standard (European On Board Diagnosis).

Putting the networks on stand-by

When there are all the conditions for putting on stand-by and there is no request for activation in progress: the Body Computer Node sends a "putting on stand-by" message over the CAN, CAN CAR and CAN CONFORT buses, to go onto stand-by; at the same time, the Body Computer Node starts a timeout and transmits the "putting on network stand-by" messages, the Nodes no longer communicate, unless there is a request for activation, before the end of timeout, the CAN, CAN CAR and CAN CONFORT buses pass onto stand-by, the +CAN is interrupted by the Body Computer Node
at the end of timeout, the Body Computer Node goes onto stand-by.

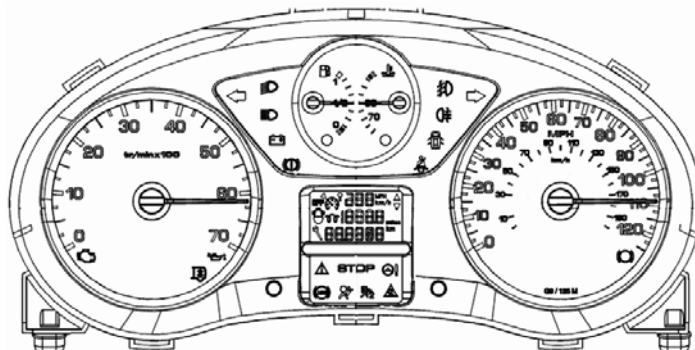
Battery disconnection/connection

When disconnecting or connecting the battery, the networks go onto stand-by, irrespective of their previous state.



8.2 Instrument panel

There are 5 Instrument Panel versions.



Left-hand drive:

- With clock, Rev counter and speedometer with black background.
- Without clock, Rev counter and speedometer with black background.
- Without clock, Rev counter and speedometer with beige background.

Right-hand drive:

- With clock, Rev counter and speedometer with black background.
- Without clock, Rev counter and speedometer with black background.

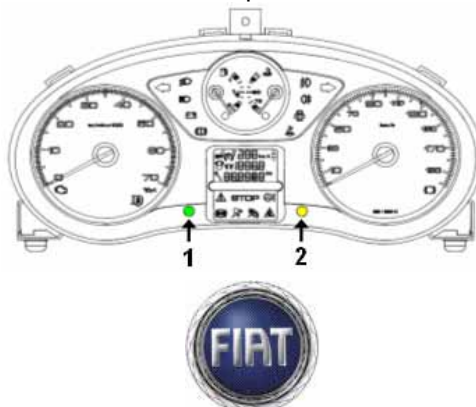
The right-hand drive instrument panel has a double speedometer scale with the miles symbol "mph" printed large and the kilometres symbol "km/h" small in the middle.



Warning:

- The left-hand drive instrument panel, configured in kilometres, cannot change unit of measurement.
- The right-hand drive instrument panel, configured in miles, can change unit of measurement into km.

All versions of the instrument panel have two central push-buttons for the following functions:



Version with clock:

Push-button (1): Rheostat for lighting, Clock adjustment

Push-button (2): Trip odometer reset, Km reset

Version without clock:

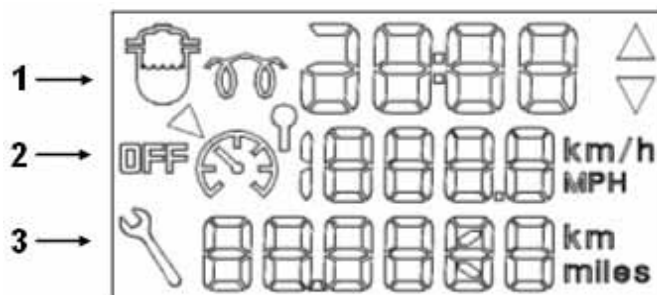
Push-button (1): Rheostat for lighting

Push-button (2): Trip odometer reset, Km reset

Central display

In the middle of the instrument panel there is a display that can show different information. The information shown on this display can change depending on whether there is a clock.

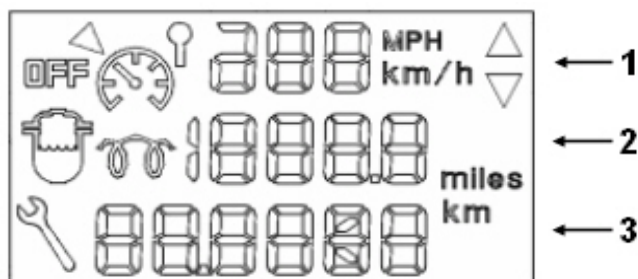
Display with clock:



Key:

1. Water in diesel filter, glow plugs, Clock
2. Cruise Control, Km/h or MPH trip counter,
3. Service, Total Km or MPH.

Display without clock:

















Key:














1. Cruise Control, Vehicle speed,
2. Water in diesel filter, glow plugs, Km/h or MPH trip counter
3. Service, Total Km or MPH



Table listing fault/alert warning lights:

Name Indicator light	Symbol
Low-beam headlamps	
Main beam headlamps	
Fog lamps	
Rear fog lights	
Left direction indicator	
Right direction indicator	
EOBD failure	
ESP failure	
ABS failure	
AIRBAG failure	
Passenger AIRBAG inhibition	
Fuel reserve	
SERVICE	
Preheating glow plugs	

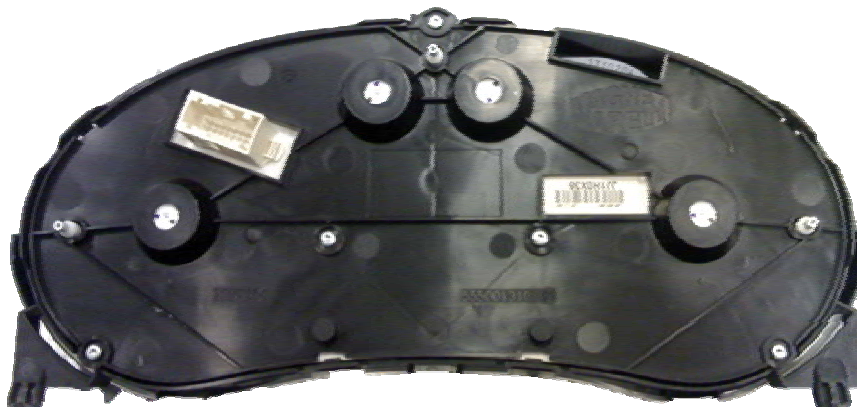


Name Indicator light	Symbol
Presence of water in the diesel fuel filter	
Battery	
Oil pressure and temperature	
Water temperature and level	
Doors open	
Electro-drive failure	
STOP	
Seat belts	
CAAR - Rear air suspensions	
Tyre puncture	
Anti-particulate filter (FAP)	
Brake wear	
ECO	



PIN-OUT

The instrument panel is equipped with an 18-way connector for hooking up with the vehicle's electric system:



Pin	Description
1	Sortie Témoin de non bouclage conducteur (uniquement sur combiné sans montre)
2	Sortie Témoin de non bouclage passager avant (uniquement sur combiné sans montre)
3	Sortie Lunette Chauffante
4	Sortie Détection Obstacle de Proximité
5	Sortie Warning
6	Entrée ESP
7	Entrée Demande d'enclenchement des CTP
8	Entrée Lunette chauffante
9	Entrée A/C Climatisation
10	+Permanent (fonction montre uniquement)
11	Sortie ESP
12	Entrée Détection Obstacle de Proximité (AAS)
13	Entrée Demande de cylindrée Maximum du compresseur
14	CAN_H - CAN LS CONF (125 Kb/s)
15	CAN_L - CAN LS CONF (125 Kb/s)
16	+ CAN
17	Sortie Témoin inhibition Airbag (uniquement sur combiné sans montre)
18	Ground



Input and output signals

The following tables give the Instrument Panel's input and output signals:

INPUT SIGNAL

A/C Off/On
Heated rearscreen
Request from A/C to turn on **CTP ?**
Request for max compressor displacement
Parking sensor signal (AAS)
ESP push-button activation

OUTPUT SIGNAL

Parking sensor signal (AAS)
Heated rearscreen
WARNING
Front passenger Airbag
Passenger Airbag inhibition
Driver's belt not fastened
Request for Driver's belt not fastened warning light
blinking
Passenger's belt not fastened
Request for Passenger's belt not fastened warning light
blinking
Type of power steering installed on the vehicle



8.3 DOOR CONTROL

General

The central locking system does not have a dedicated control unit, but is managed directly by the Body Computer Node (NBC).

The vehicle can be configured with different solutions:

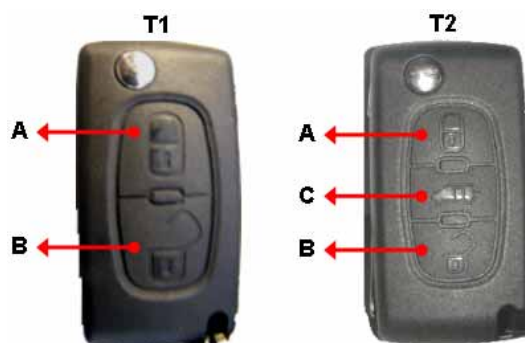
- Classic Front Doors,
- Sliding mechanical Side Doors (2nd door is optional),
- Rear hatchback or two-door back.

Note: Only the driver's door and the rear hatch door have a lock and key.

The system controls door locking and unlocking according to the commands given by the user or by specific system settings:

- Remote control,
- Mechanic key,
- Push-button on the dashboard,
- Orders for opening.... for example after an accident,
- Orders for automatic locking with the vehicle in motion,
- Alarm cut-in and cut-off,

The central locking system has two types of remote control depending on the version of the vehicle:



Key:

A: Locking control button

B: Unlocking control button

C: Selective control button (sliding side doors and hatchback)

T1 = Combi vehicle version

T2 = Van vehicle version

Remote control functions

Van model:

- Simple locking,
- Super locking,
- Automatic locking with vehicle in motion,
- Child safety,
- Vehicle localization.

Combi model

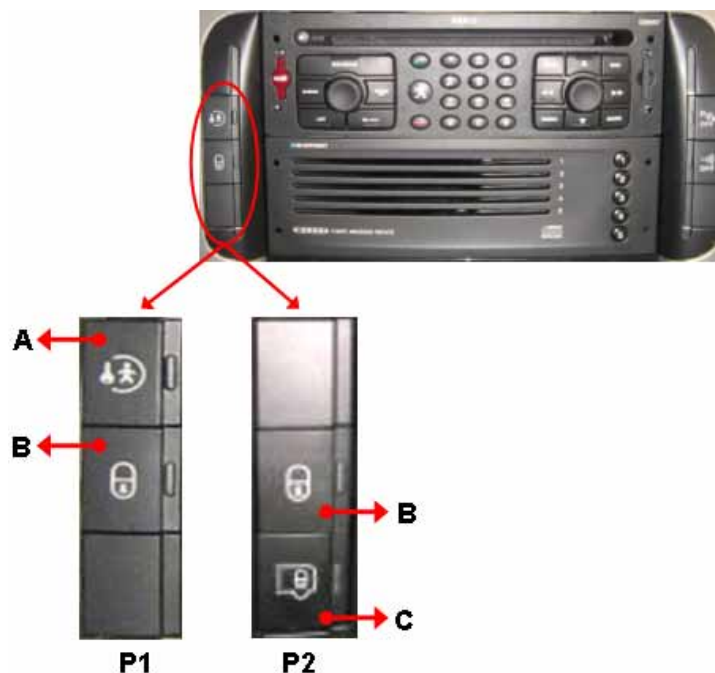
- Simple locking,
- Super locking,



- Automatic locking with vehicle in motion,
- Selective locking.

Push-buttons inside the vehicle

Inside the vehicle on the central dashboard to the left of the radio, depending on the version of the vehicle, there are the buttons shown in the figure.



Key:

- A: Child safety button
- B: Central locking button
- C: Side sliding door and rear hatch locking/unlocking button
- P1: Combi vehicle version
- P2: Van vehicle version

Operation

The following tables describe the operating strategies of the central locking with remote control or mechanical key.

REMOTE CONTROL T1 AND T2 – BUTTON A		
Control	Initial state	Event generated
Single press	<ul style="list-style-type: none"> Vehicle unlocked Cab unlocked Goods compartment unlocked 	Request to lock the vehicle
Single press, with vehicle closed for less than 5sec.	Vehicle locked	No action
Single press, with vehicle	Vehicle locked	Request to locate the vehicle



closed for more than 5sec.		
----------------------------	--	--

REMOTE CONTROL T1 AND T2 – BUTTON B

Control	Initial state	Event generated
Single press	Vehicle unlocked	Request to unlock the cab
Single press	Goods compartment locked	Request to unlock the vehicle
Single press	Cab unlocked	Request to unlock the vehicle
Single press	Vehicle unlocked	No request

REMOTE CONTROL T2 – BUTTON C

Control	Initial state	Event generated
Single press	Vehicle locked	Request to unlock the goods compartment
Single press	Cab unlocked	Request to unlock the vehicle
Single press	Goods compartment unlocked	No action

Driver's door lock

Control	Initial state	Event generated
When locking		
Turn of key	<ul style="list-style-type: none"> Vehicle unlocked Cab unlocked Goods compartment unlocked 	Request to unlock the vehicle
Turn of key, with vehicle closed for less than 5sec.	Vehicle locked	No request
Turn of key, with vehicle closed for more than 5sec.	Vehicle locked	No request
When unlocking		
Turn of key	Vehicle locked	Request to unlock the cab
Turn of key	Goods compartment unlocked	Request to unlock the vehicle
Turn of key	<ul style="list-style-type: none"> Cab unlocked Vehicle unlocked 	No request



Rear hatch lock		
Control	Initial state	Event generated
When locking		
Turn of key	<ul style="list-style-type: none"> Vehicle unlocked Cab unlocked Goods compartment unlocked 	Request to lock the vehicle
Turn of key, with vehicle closed for less than 5sec.	Vehicle locked	No request
Turn of key, with vehicle closed for more than 5sec.	Vehicle locked	No request
When unlocking		
Turn of key	Vehicle locked	Request to unlock the goods compartment
Turn of key	Cab unlocked	Request to unlock the vehicle
Turn of key	<ul style="list-style-type: none"> Vehicle unlocked Goods compartment unlocked 	No request

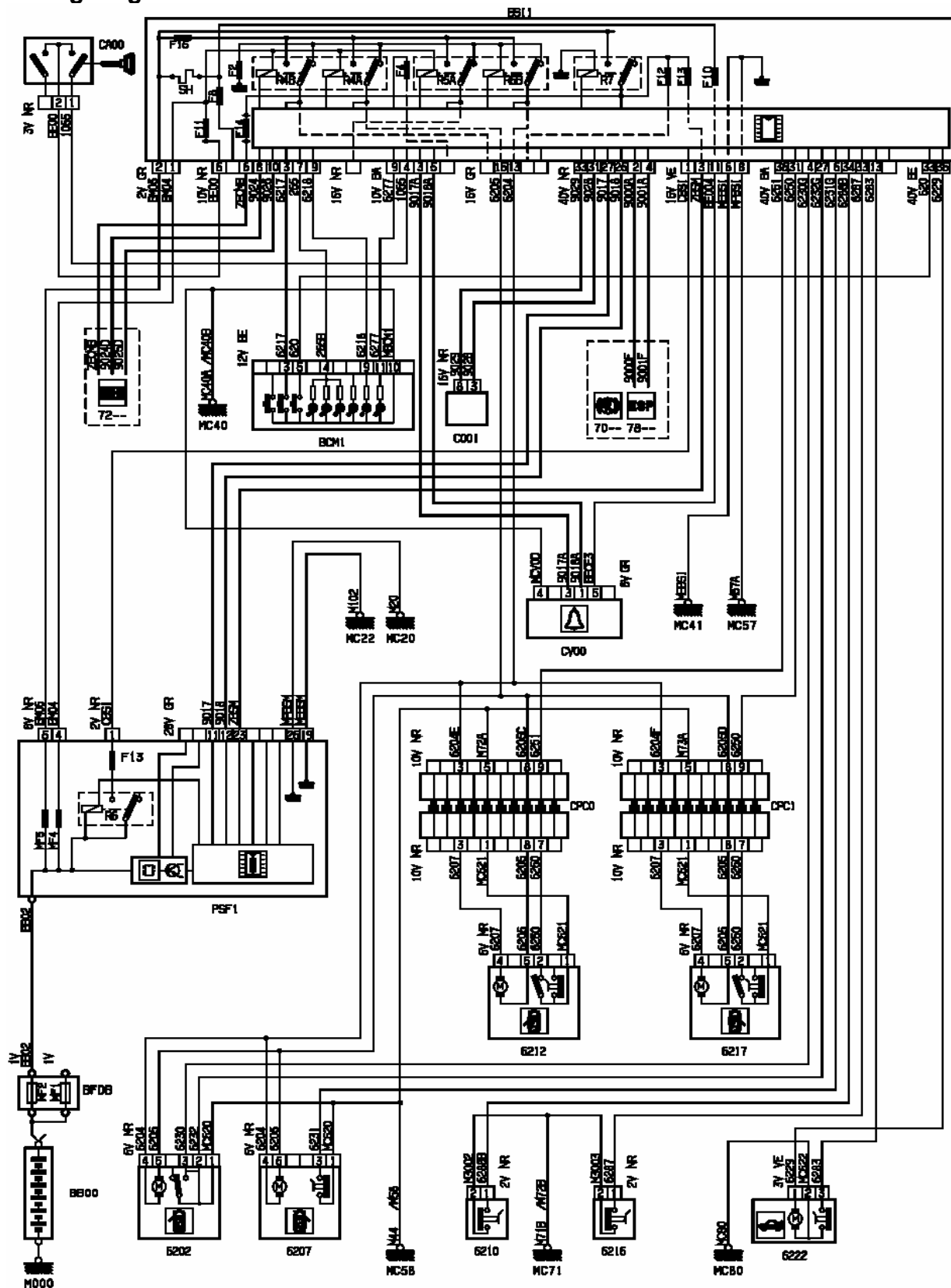
Wiring diagrams

The diagrams shown are the following:

- Wiring diagram 151: Central Locking - Vehicle with Door
- Wiring diagram 154: Central Locking - Hinged rear doors
- Wiring diagram 157: Central Locking - Vehicle with Door
- Wiring diagram 160: Central Locking - Hinged rear doors
- Wiring diagram 163: Super Central Locking - Vehicle with Door
- Wiring diagram 166: Central Locking - Hinged rear doors
- Wiring diagram 169: Super Central Locking - Vehicle with Door
- Wiring diagram 172: Super Central Locking - Hinged rear doors

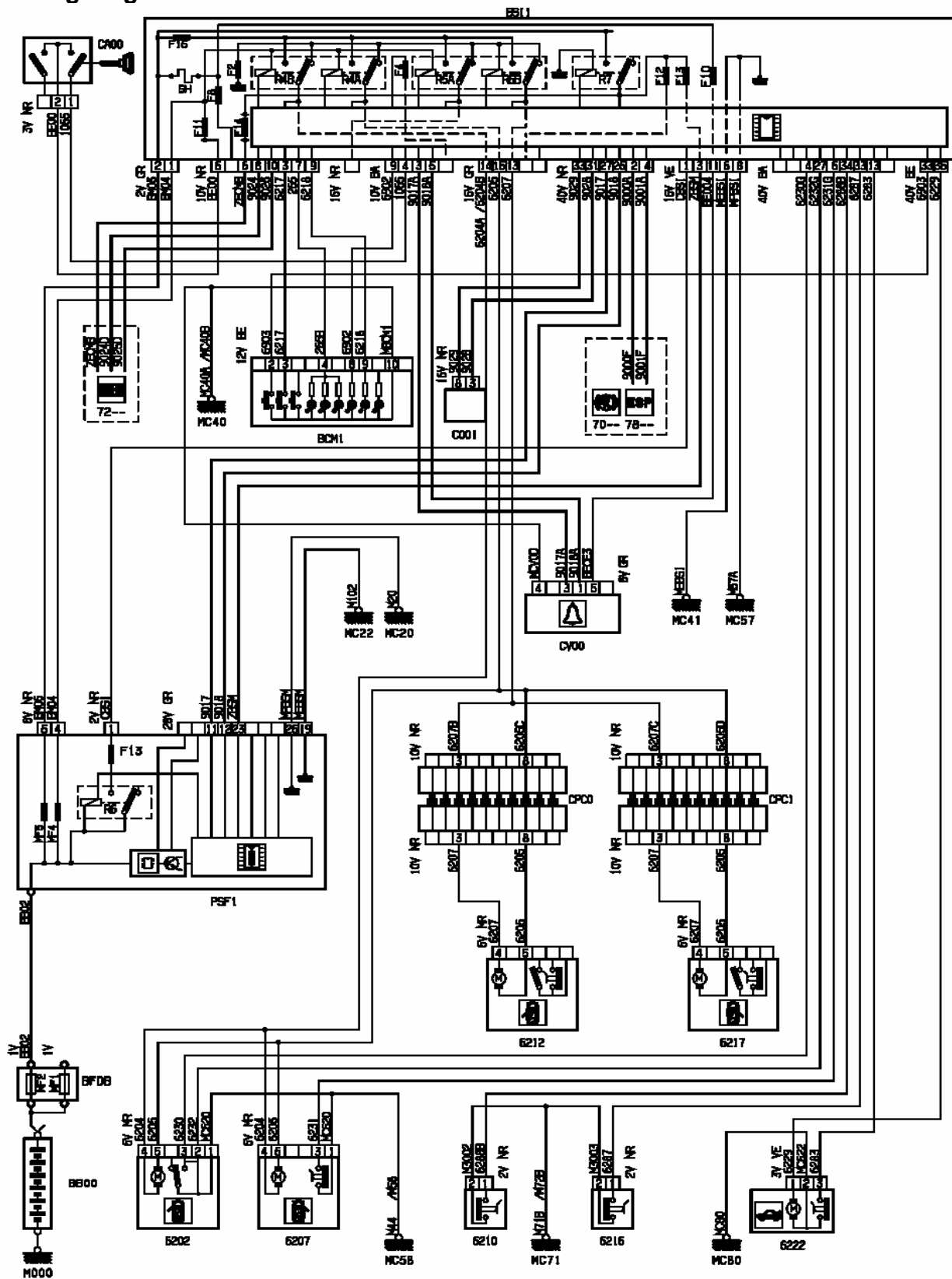


Wiring diagram 151

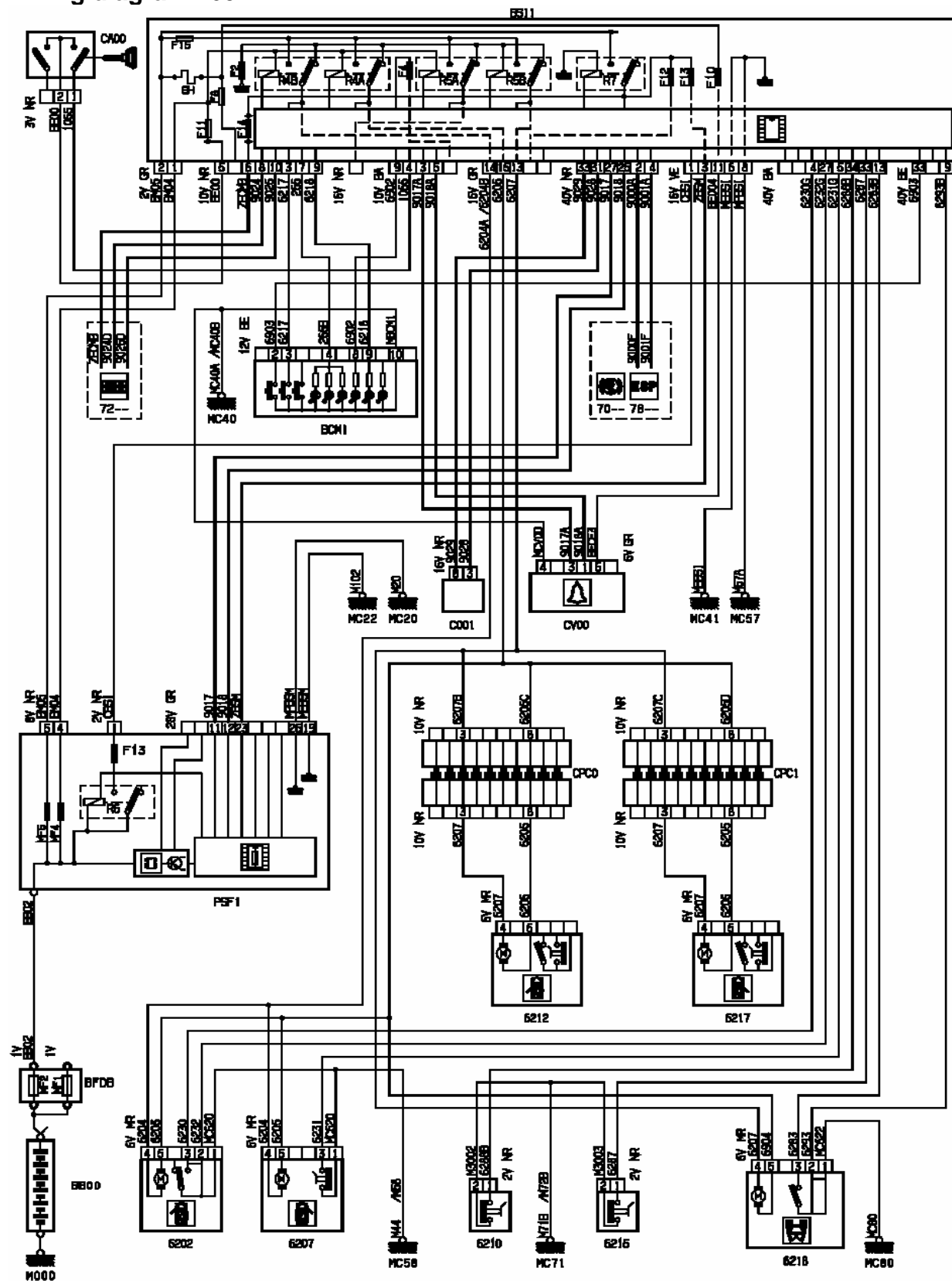




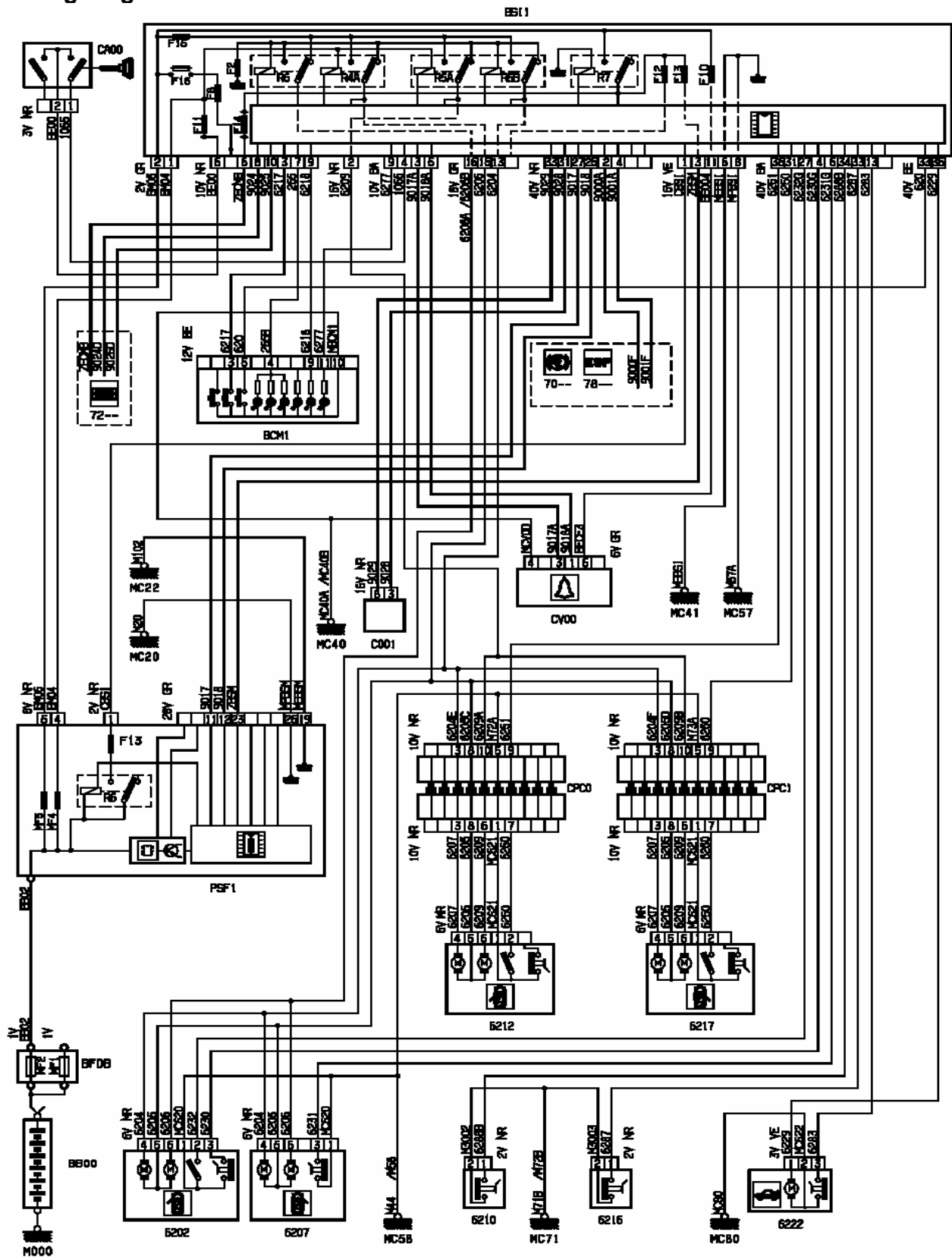
Wiring diagram 157



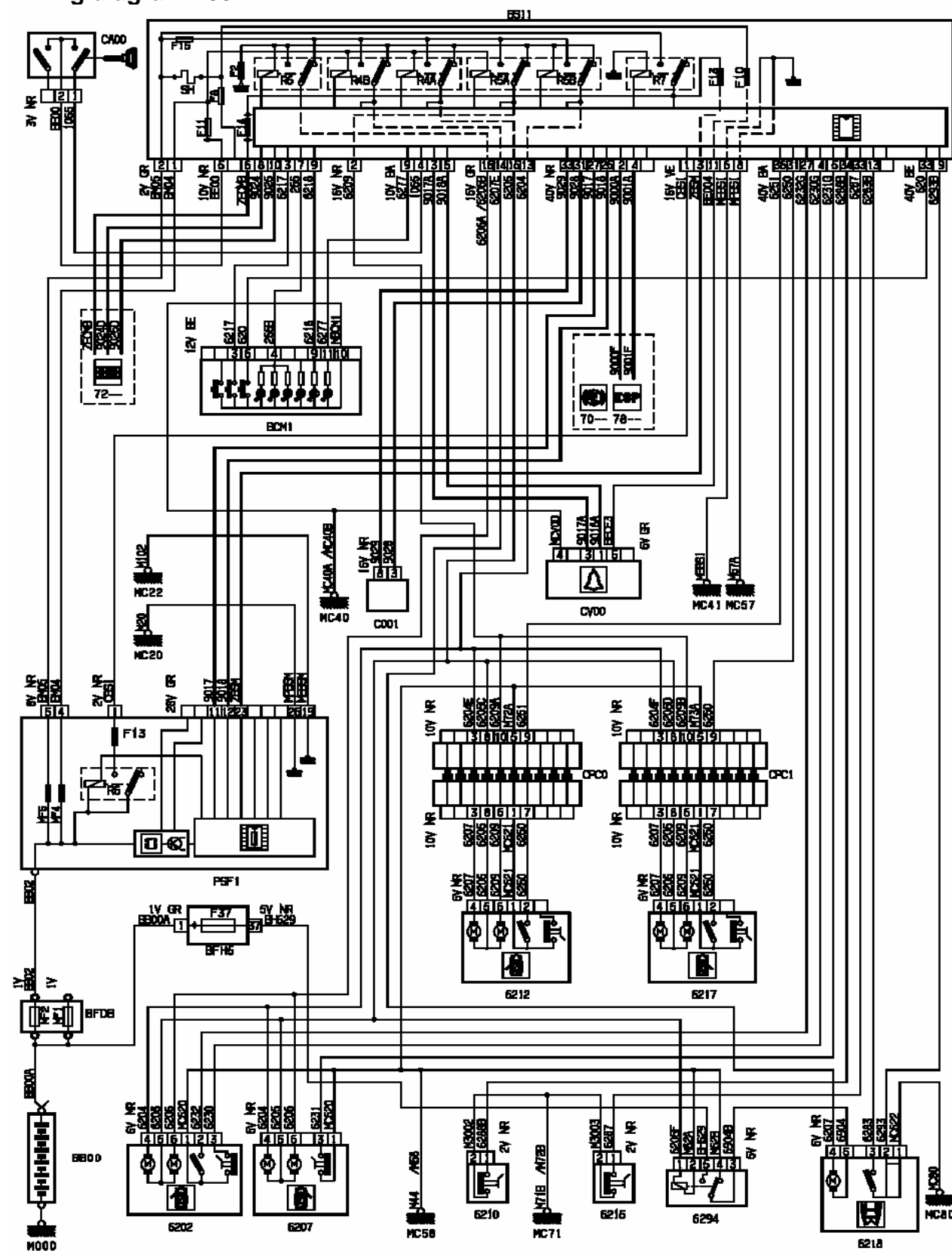
Wiring diagram 160



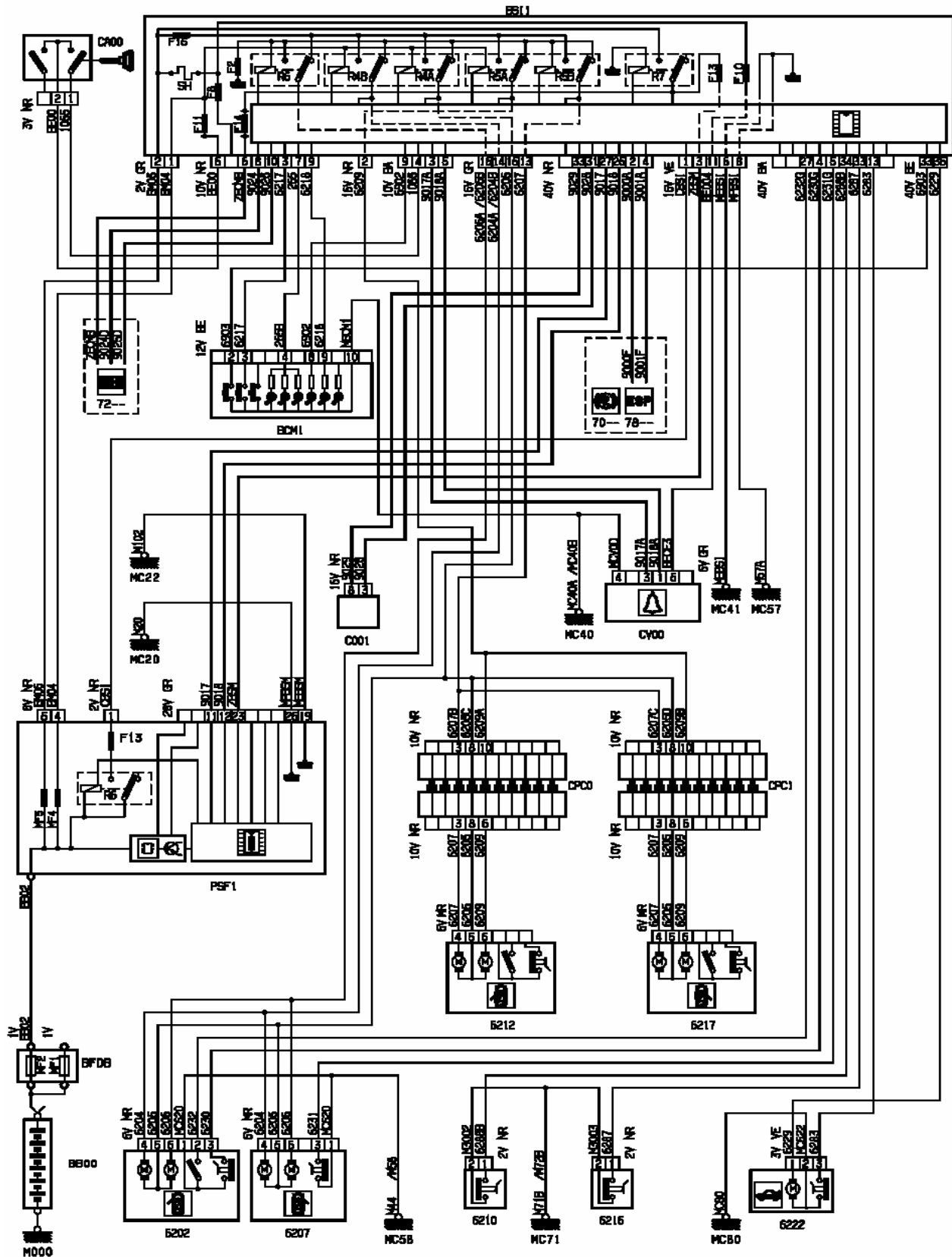
Wiring diagram 163



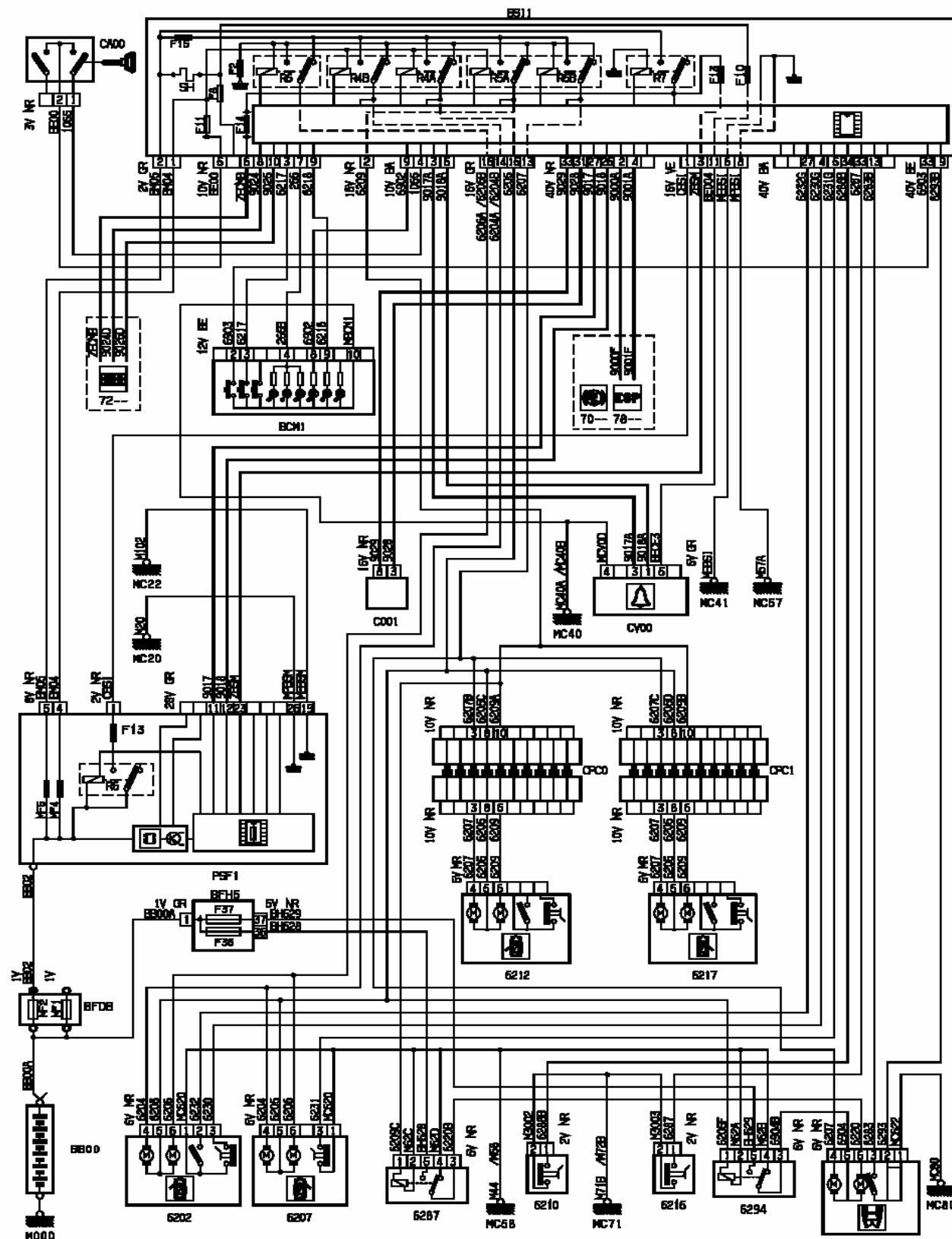
Wiring diagram 166



Wiring diagram 169



Wiring diagram 172



Diagrams key

6202 : ENSEMBLE SERRURE PORTE CONDUCTEUR
6207 : ENSEMBLE SERRURE PORTE PASSAGER
6210 : CONTACTEUR PORTE OUVERTE ARRIERE
6212 : ENSEMBLE SERRURE PORTE ARRIERE GAUCHE
6215 : CONTACTEUR PORTE OUVERTE ARRIERE DROIT
6217 : ENSEMBLE SERRURE PORTE ARRIERE DROITE
6218 : ENSEMBLE SERRURE PORTE BATTANTE
6222 : ENSEMBLE SERRURE COFFRE
6294 : RELAIS COMMUN COFFRE
6287 : RELAIS OUVERTURE COFFRE
BSI : Body Computer (NBC)
BCM1 : BLOC COMMUTATEUR MULTIFONCTIONS GAUCHE
BB00 : BATTERY
BFDB : Max fuses on the battery positive cable
BFH5 : 40A fuse
C001 : CONNECTEUR DIAGNOSTIC
CV00 : MODULE DE COMMUTATION SOUS VOLANT (COM 2000)
MC58 : Ground
M000 : Battery ground
PSF1 : PLATINE DE SERVITUDE-BOITE FUSIBLES



8.4 Power windows and rear-view mirrors

General

The power windows system does not have a dedicated control unit, it is managed directly by the Body Computer Node (NBC).

The vehicle can be configured with different solutions, see the table:

Component	Fourgone L 1	Fourgone L 2	Combi L 1	Combi L 2 Leisure time	Combi L 2 Business
2nd sliding side door	O	O	O	O	S
Back with two doors	S	S	S	-	-
Child safety	-	-	S	S	S
Super locking	O	O	O	O	O
Passenger power window button	S	S	-	-	-
Passenger power window button with automation	-	-	S	S	S
Adjustable external electric and manually tilting rear- view mirrors.	O	S	O	S	S
Adjustable external and electric tilting rear-view mirrors.	O	O	O	O	O

Depending on the setup used there are different versions of the switch unit on the doors, according to the following table:

Switch unit		Power Windows		Adjustable external	
		Driver	Passenger	Adjustment	Tilting
1B	Left	A	E	M	M
3B		A	E	E	M
1C		A	A	M	M
3C		A	A	E	M
4C		A	A	E	E
9D	Right	- - -	E	M	M
9E		- - -	A	M	M

Table key:

- E : electric control
- A : electric control with automatic function
- M : manual control

Note: The switch unit with automatic function (A) has anti-pinch safety



Switch unit

The following figures show the different setups of the power window switch unit.



Wiring diagrams

The diagrams shown are the following:

- diagram 145 : Power windows – version Level 1
- diagram 148 : Power windows – version Level 2
- diagram 175 : External rear-view mirrors with electric adjustment and manual tilting
- diagram 178 : External rear-view mirrors with electric adjustment and tilting

Operation

- The setup illustrated in **diagram 145** is for the power window system with vehicle version level 1. In this setup the Body Computer (NBC) supplies a direct battery positive protected by fuses and by key positive (+APC).

- The setup illustrated in **diagram 148** is for the power window system with vehicle version level 2. In this setup the Body Computer (NBC) supplies a direct battery positive protected by fuses and by key positive (+APC).
The difference with the wiring diagram 145 consists in the different connection of the passenger power window motor.

- The setup illustrated in **diagram 175** is for the ext. rear-view mirror system with electric adjustment and manual tilting.
In this setup the Body Computer (NBC) supplies a key positive (+APC).

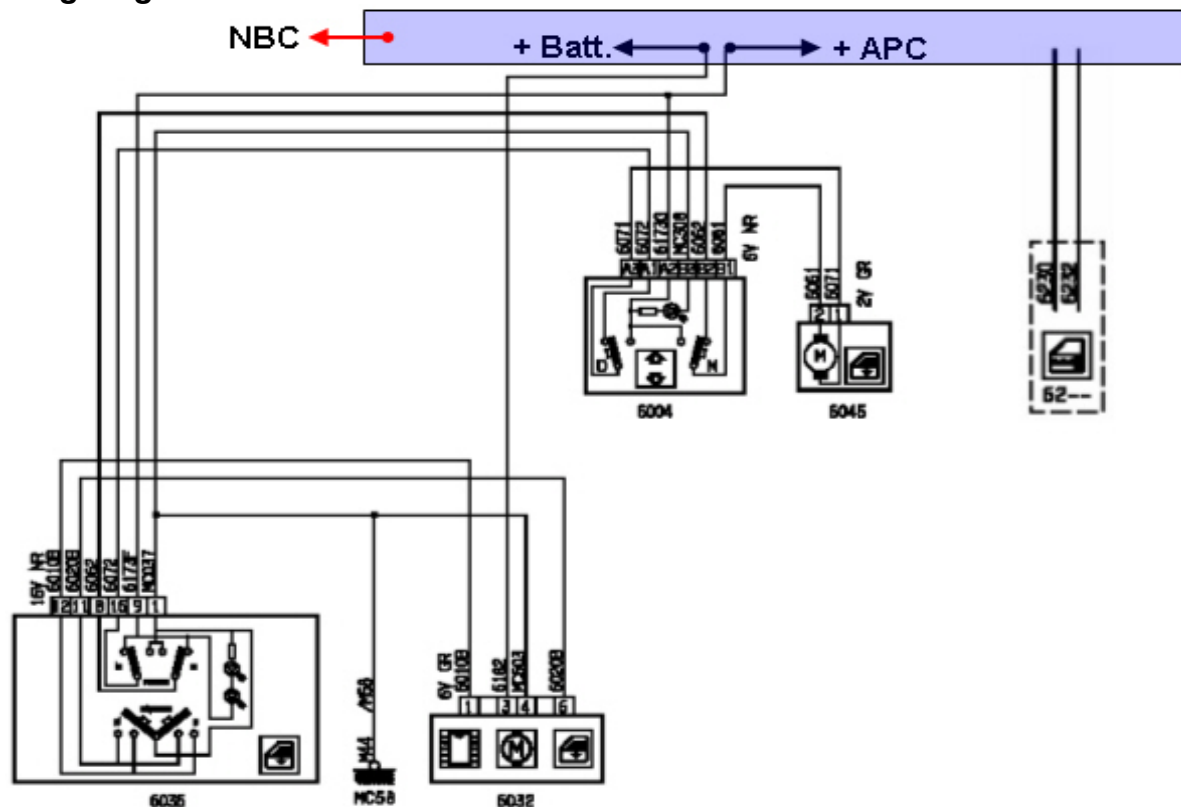
- The setup illustrated in **diagram 178** is for the ext. rear-view mirror system with electric adjustment and tilting.
In this setup the Body Computer (NBC) supplies a key positive (+APC) and two command signals (C1 and C2) for the relays related to the polarity reversal of the power supply of the motors for opening (6408) and closing (6409) the ext. rear-view mirrors.

Note: *Points C3 and C4 with non-controlled relays have a potential of 0 Volt (ground).*

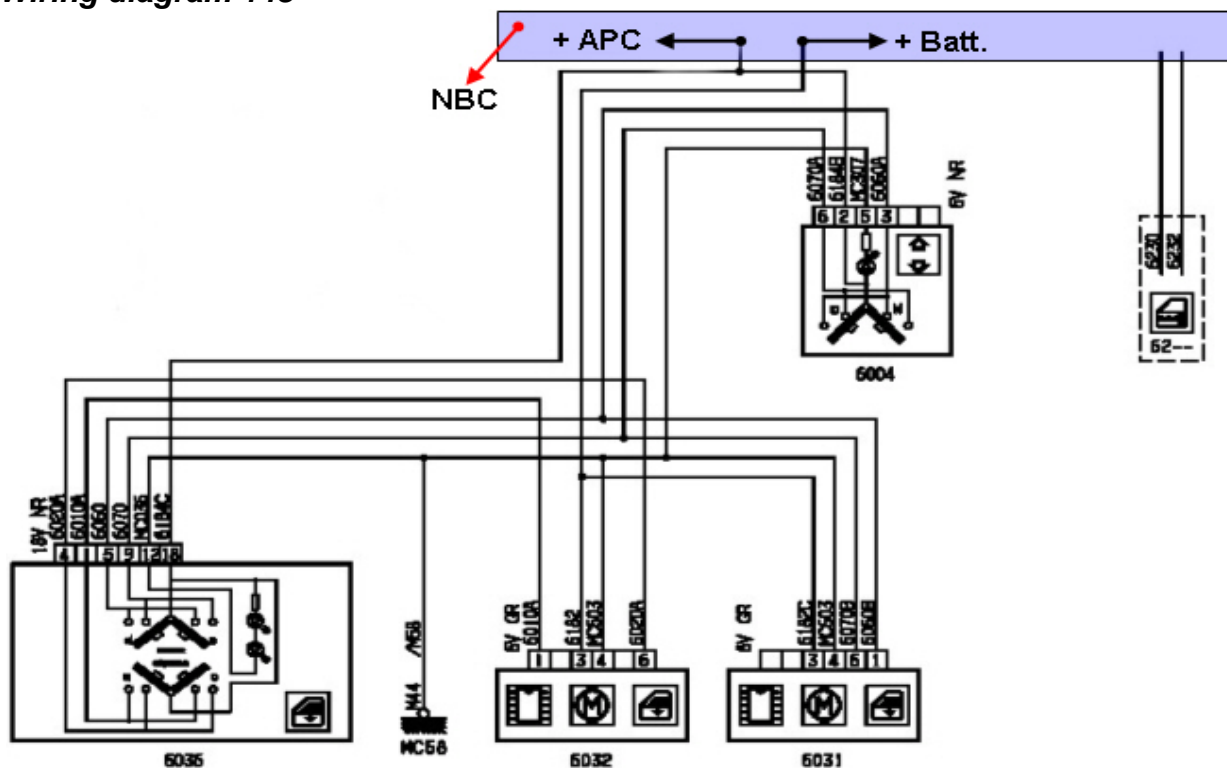
In its turn the Body Computer (NBC) receives the command ground signal (S) for opening and closing the ext. rear-view mirrors from the driver control assembly (6436).



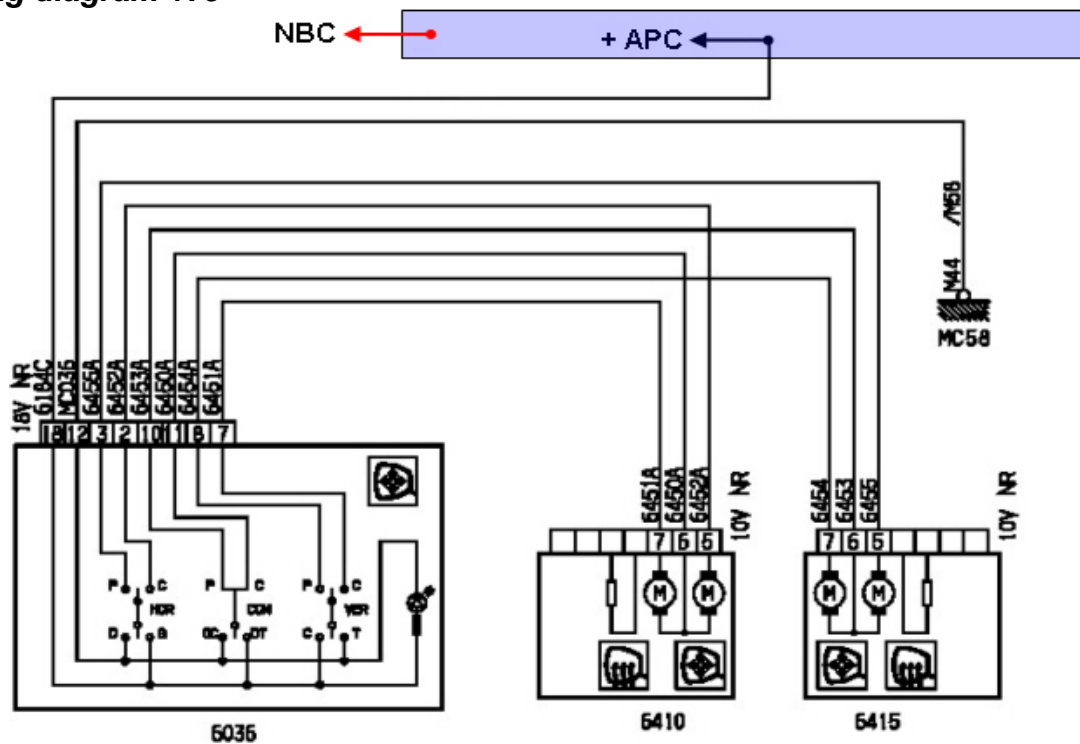
Wiring diagram 145



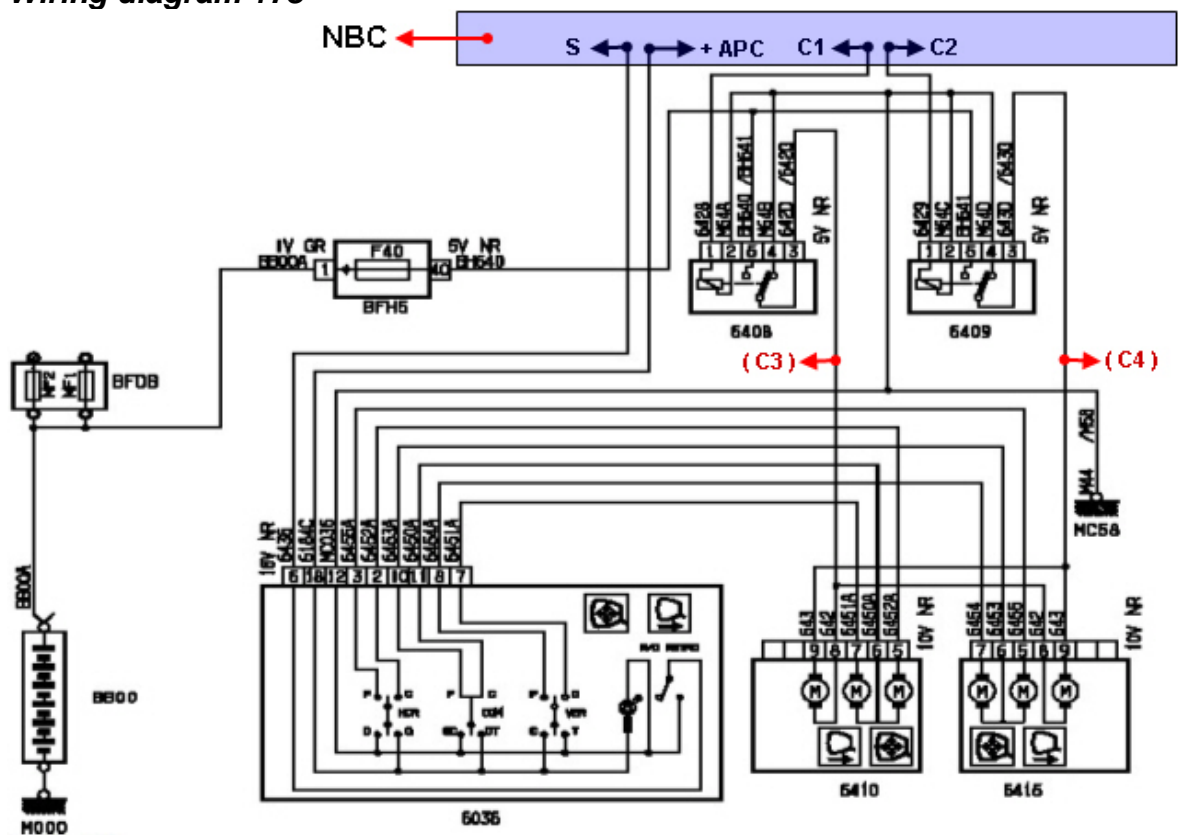
Wiring diagram 148



Wiring diagram 175



Wiring diagram 178



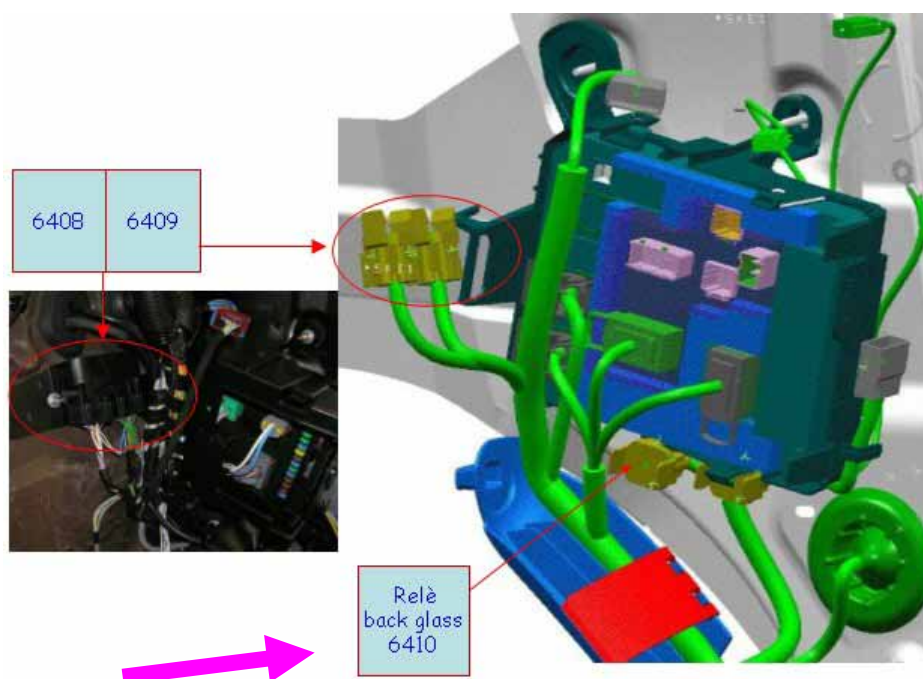
Power window wiring diagrams key

6004 : Passenger power window switch
6031 : Front passenger power window motor
6032 : Front driver power window motor
6035 : Driver's anti-pinching
6036 : Rear power window control - driver
6045 : Passenger power window motor

Electric mirror wiring diagrams key

6408 : Ext. rear-view tilting relay (mirrors closed)
6409 : Ext. rear-view folding relay (mirrors open)
6410 : Driver rear-view mirror
6415 : Passenger rear-view mirror
BSI : Body Computer (NBC)
BB00 : BATTERY
BFDB : Max fuses on the battery positive cable
BFH5 : 40A fuse
MC58 : Ground
M000 : Battery ground

Location of power window and rear-view mirror relays



6408 : Ext. rear-view tilting relay (mirrors closed)
6409 : Ext. rear-view folding relay (mirrors open)
6410 : Rear windows relay



8.5 AIRBAGS

The Airbag system (BOSCH) equipping the vehicle triggers after front or side impact with medium-high severity to protect the occupants and in this regard the Airbag system governs the different safety mechanisms:

- 1 front driver airbag,
- 1 driver belt pretensioner,
- 1 side driver chest airbag,
- 1 front middle passenger pretensioner
- 1 front right passenger front airbag,
- 1 front right passenger pretensioner
- 1 front right passenger chest side airbag,
- 1 left curtain side airbag,
- 1 right curtain side airbag,

Warning: For the Airbag system to be able to perform its function with the utmost effectiveness it is necessary for the occupants to use the safety belts correctly.

The setups of the front seats are given in the following summary table:

Front seat version	Van		Combi	
	Level 1	Level 2	Level 1 5-6 seats 8-9 seats	Level 2 8-9 seats
Fixed 2-passenger bench seat	O	O	O	O
2 seats with height/angle adjustment	S	S	S	O
Heated seats	O	O	O	O

The different setups of the front seats require a specific setup of the airbags and specifically:

2 front seat version:

- Driver:

- front airbag
- chest side airbag
- belt pretensioner

- Passenger:

- front airbag
- chest side airbag
- belt pretensioner

Version with 1 front seat + 1 bench seat:

- Driver:

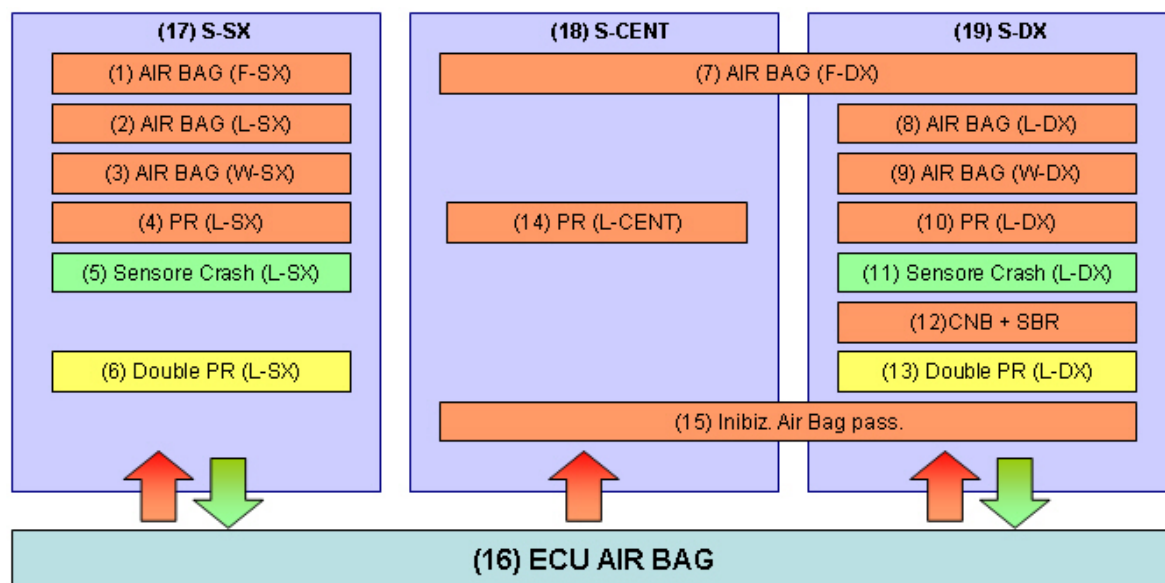
- front airbag
- chest side airbag
- belt pretensioner

- Passenger:

- front airbag
- belt pretensioner

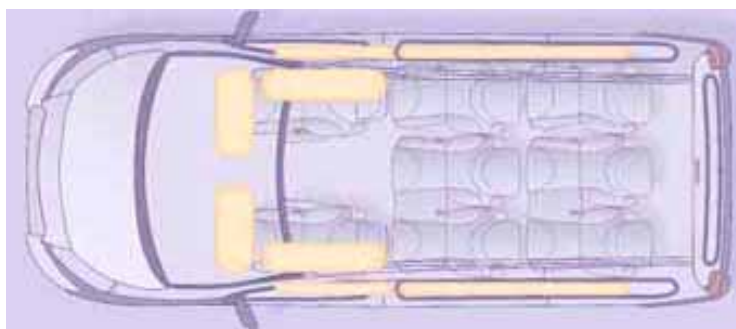


Functional configuration diagram



Key:

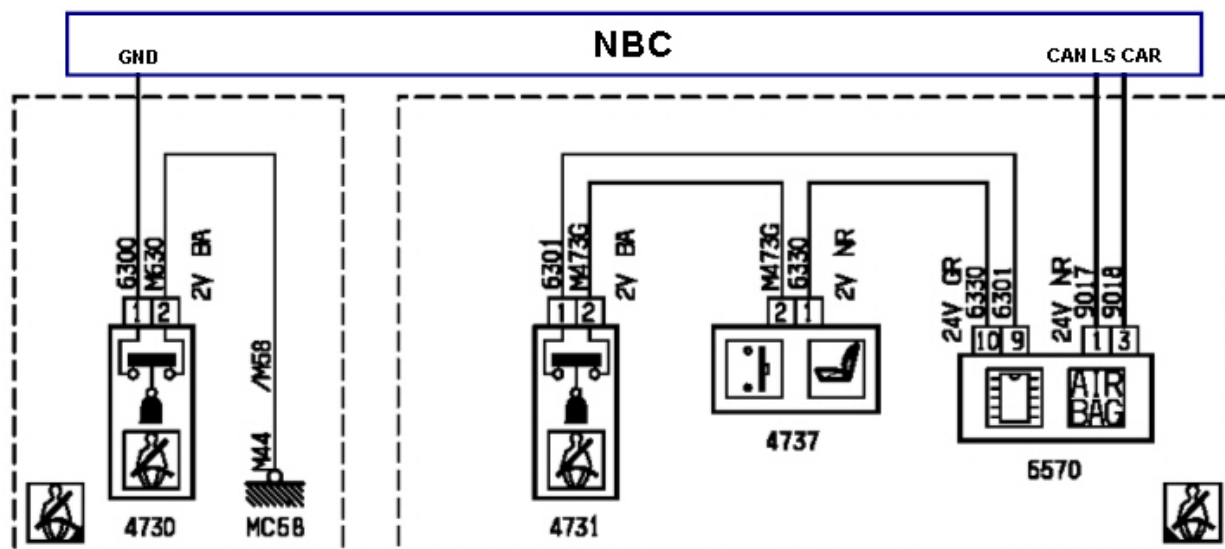
1. front driver airbag
2. side driver chest airbag
3. left curtain side airbag
4. driver belt pretensioner
5. left side impact satellite sensor
6. double driver belt pretensioner (fitting)
7. passenger front airbag
8. passenger chest side airbag
9. right curtain side airbag
10. passenger belt pretensioner
11. right side impact satellite sensor
12. Passenger belt fastened switch (CNB) + passenger sensor (SBR)
13. double passenger belt pretensioner (fitting)
14. middle passenger belt pretensioner (with bench seat only)
15. passenger airbag disabling key switch
16. Air Bag control unit
17. Driver seat
18. Double seat (18 + 19 = bench seat)
19. Passenger seat



Passenger belt fastened switch (SBR) and passenger sensor (CNB)

Sensors SBR (4731) and CNB (4737) are connected to the Airbag control unit (6570) that in its turn sends the status information, over the Can LS CAR network, to the Body Computer (NBC) to control the related warning lights on the instrument panel. The information relating to the driver belt switch (4730) is sent directly to the NBC.

Sensors SBR (4731) and CNB (4737) are connected in series.






SBR sensor

The vehicle is equipped with the system called S.B.R. (Seat Belt Reminder).

The job of the sensor is to tell the Airbag control unit whether the passenger's seat belt is fastened. If the seat belt is not fastened the system generates a warning message (warning light on the panel + audible warning).

The audible warning can be temporarily turned off (until the engine is next switched off) with the following procedure:

-  allacciare la cintura di sicurezza lato guida e lato passeggero;
-  ruotare la chiave di avviamento in posizione **M**;
-  attendere più di 20 secondi quindi slacciare la cintura sicurezza (guidatore o passeggero).

CNB sensor

The passenger sensor is resistive and has the job of detecting a passenger on the seat and subsequently activating or not activating the airbags for passenger protection.

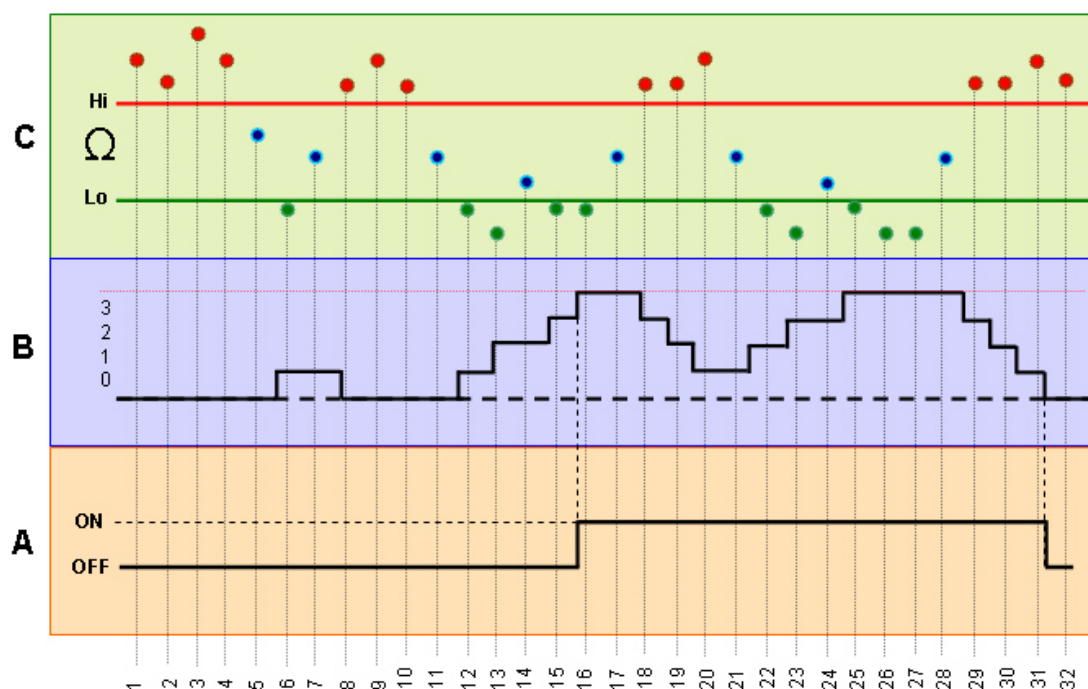
The sensor is under the upholstery of the passenger seat.



CNB sensor operation

The following graphic shows the strategy for detecting a passenger on the seat.
The graphic is divided into three areas, specifically:

- A. Graphic highlighting the condition (ON) or (OFF)
ON : passenger present
OFF : passenger not present
- B. Graphic highlighting the count by the Airbag control unit
0 : passenger not present
3 : passenger present
- C. Graphic highlighting the resistance levels for detecting a passenger.
Resistance : (Lo) 390 Ω ÷ 510 Ω (passenger present)
(HI) 870 Ω ÷ 1020 Ω (passenger not present)



- The airbag control unit **increases** the count (zone B) when the resistance of the SBR sensor is less than the limit (LO). See points: 6, 12, 13, 15, 16, 22, 23, 25.

Note: The points in zone (C) 26, 27 do not increase the count but keep the maximum permissible value, that is 3.

- The airbag control unit **decreases** the count (zone B) when the resistance of the SBR sensor is greater than the limit (HI). See the points in zone (C): 8, 18, 19, 20, 29, 30, 31, 32.

Note: The points in zone (C) 1, 2, 3, 4, 9, 10, do not decrease the count but keep the minimum permissible value, that is 0.

- The airbag control unit **blocks** the count (zone B) when the resistance of the SBR sensor is between the (LO) and (HI) settings. See the points in zone (C): 5, 7, 11, 14, 17, 21, 24, 28.



Messages on the CAN network

Airbag node:

Receives

- The status of the air bag system failure warning light.
- The status of the front passenger air bag inhibition warning light.
- The vehicle speed.

Emits

- The "air bag system failure" information.
- The "front passenger airbag inhibited" information.

Computer Body Node:

Receives

- The "air bag system trouble" information.
- The "front passenger airbag inhibited" information.
- The status of the air bag system failure warning light.
- The status of the front passenger air bag cut-out warning light.
- The vehicle speed
- The type of impact

Emits

- The "air bag system trouble" information.
- The "front passenger airbag inhibited" information.
- The vehicle speed.
- The status of the air bag system failure warning light.
- The status of the front passenger air bag cut-out warning light.
- The type of shock.

Instrument Panel Node:

Receives

- The "air bag system trouble" information.
- The "front passenger airbag inhibited" information.

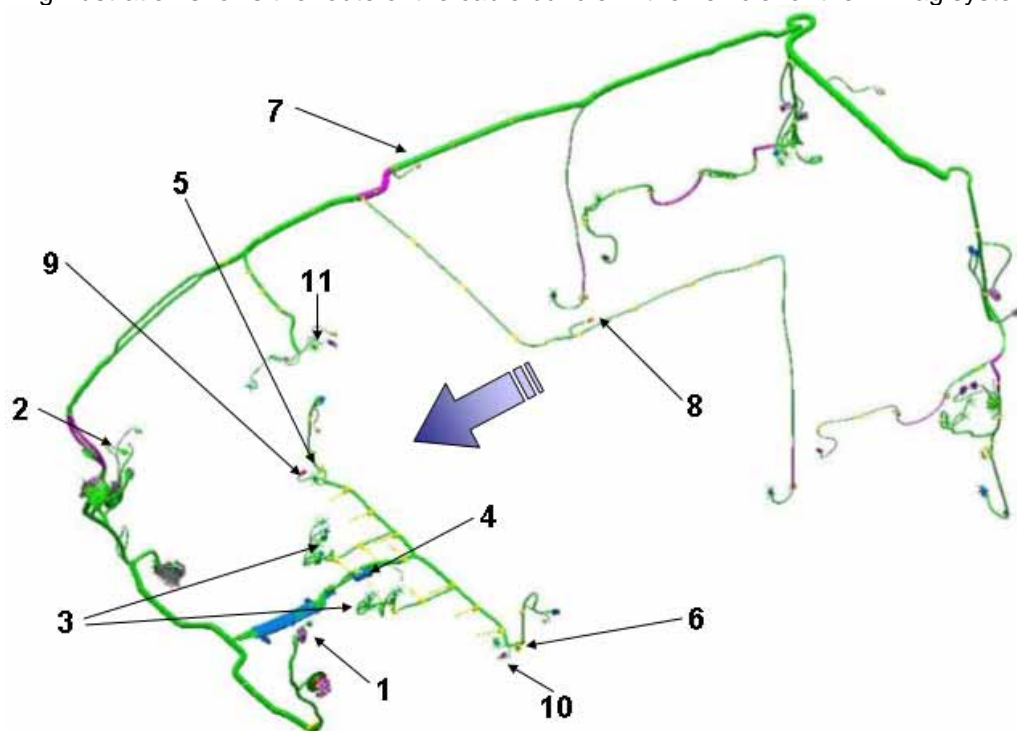
Emits

- The status of the air bag system failure warning light.
- The status of the front passenger air bag cut-out warning light.



Passenger compartment cable bundle

The following illustration shows the route of the cable bundle in the vehicle for the AirBag system.



Key:

- 1. Front driver airbag
- 2. Passenger front airbag
- 3. Front seat connections
- 4. Air Bag control unit
- 5. Passenger belt pretensioner
- 6. Driver belt pretensioner
- 7. Right curtain side airbag
- 8. Left curtain side airbag
- 9. Right side impact satellite sensor
- 10. Left side impact satellite sensor
- 11. Passenger airbag disabling key switch



Airbag control unit

The Airbag control unit is located in the middle of the vehicle between the front seats and it interfaces with the vehicle wiring by means of two 24 pin connectors, one black and one grey.

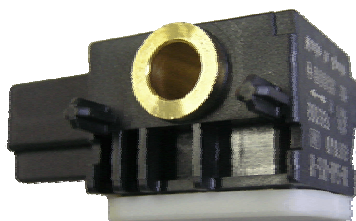
The Airbag control unit has the job of analysing the signals from the impact sensors and actuating the most appropriate safety strategies for the event of the accident.



Note: The arrow indicates the vehicle's direction of travel.

Side impact satellite sensors

The side satellite sensors have the job of informing the Airbag control unit of any side impact. This signal is used by the airbag control unit to activate the curtain and chest airbags.



The figure below illustrates the position of the satellite sensors. They are locked by a screw on the front right and left pillar.



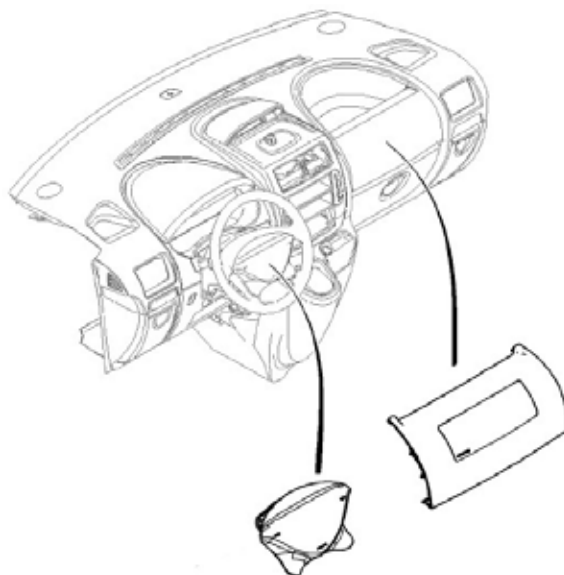
Passenger AirBag disabling switch

The passenger AirBag disabling switch is located inside the front glove compartment. See figure.



Front Airbags (driver and passenger)

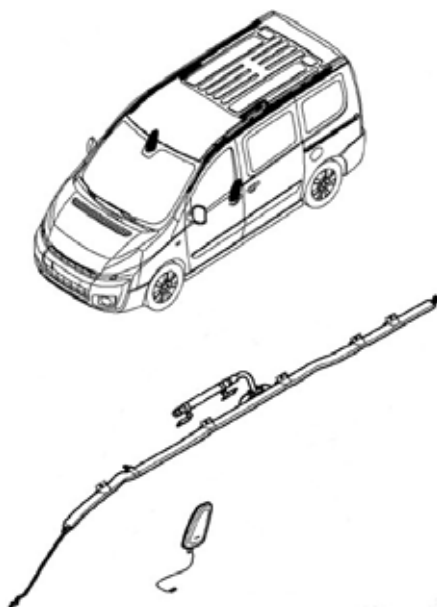
The explosive charge related to the driver's Airbag is located on the steering wheel while the explosive charge of the passenger Airbag is on the dashboard.



Curtain Airbag and chest airbag

The explosive charges related to the curtain airbag are under the covering of the roof on the right and left side, while the explosive charges related to the chest airbag are on the backrest of the driver and passenger seats.

Note: Components in bold type.

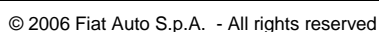


Wiring diagrams

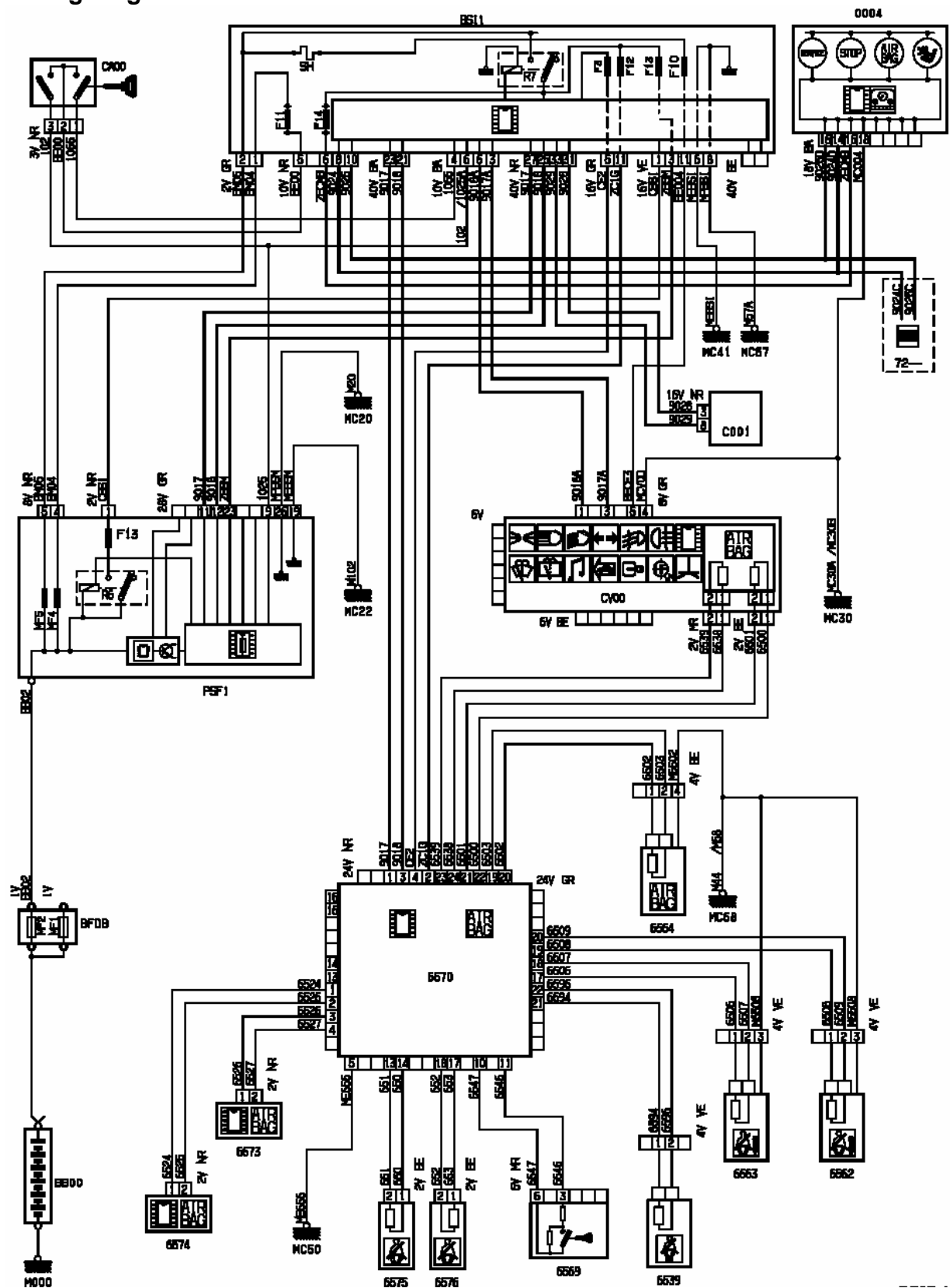
The diagrams shown are the following:

- diagram 181: System related to the version with Windows Bag and two front seats.
- diagram 184: System related to the version without Windows Bag and front bench seat.
- diagram 187: System related to the passenger sensor + Passenger safety belt switch.

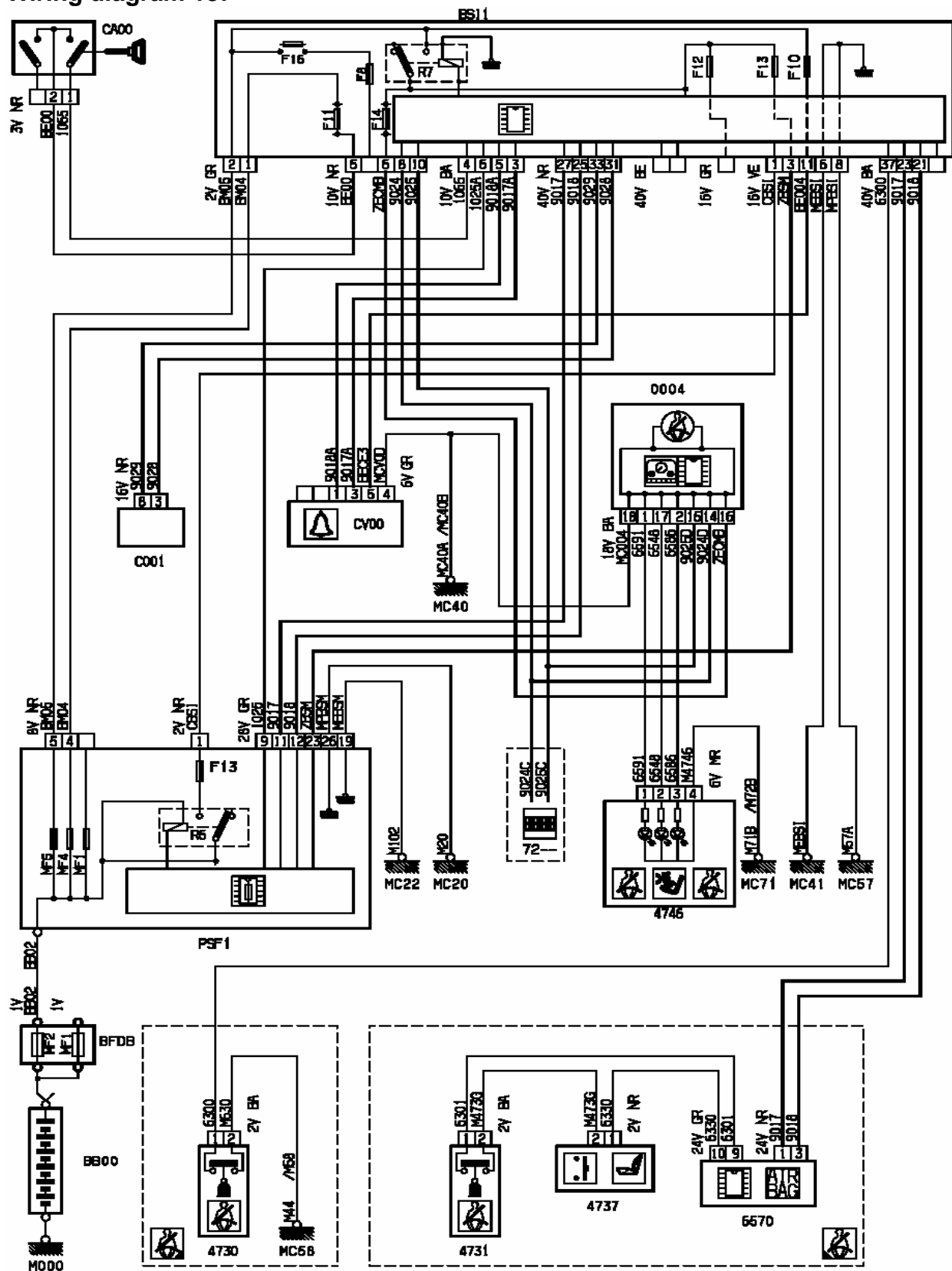




Wiring diagram 184



Wiring diagram 187



Wiring diagrams key:

4730 : Driver safety belt switch
4731 : Passenger safety belt switch
4737 : Passenger seat sensor (NAPPE)
4746 : TNB control unit

6539 : Front middle pretensioner
6551 : Right curtain airbag (Windows Bag)
6552 : Left curtain airbag (Windows Bag)
6562 : Front right side airbag
6563 : Front left side airbag
6564 : Passenger Airbag
6569 : Passenger Airbag disabling key switch
6570 : Airbag control unit
6573 : Front left satellite sensor
6574 : Front right satellite sensor
6575 : Front left pretensioner
6576 : Front right pretensioner

CV00 : SWITCHOVER MODULE UNDER STEERING WHEEL (COM 2000)
C001 : Diagnosis connector
BFDB : Max fuses on the battery positive cable
BB00 : Battery
CA00 : Ignition block
PSF1 : SERVICES FUSE BOX PLATE
BSI : Body Computer (NBC)
0004 : Instrument panel



8.6 Climate Control

The climate control for the new Fiat Scudo is summarised in the following table:

	Fourgone	Fourgone	Combi	Combi	Combi
	N 1	N 2	N 1	N 2	N 2
Additional heating (Webasto)	O	O	O	O	O
Heater (CH)					
Manual climate control (RF)	O	S	O	S	-
Automatic climate control (RFTA)	-	-	-	O	S
Rear additional climate control (*)	-	-	-	O	S

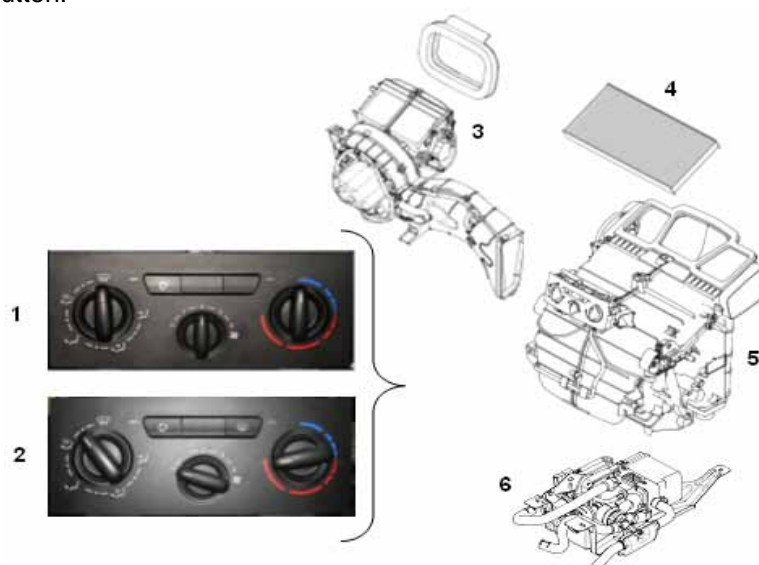
(*) : together with Automatic Climate Control (RFTA)

The quantity of R134a gas varies depending on the setup used:

- Manual and automatic climate control: 600 g
- Climate control with additional rear unit: 925 g

Heater system (CH)

The Heating System comprises two types of different control assembly due to whether there is the heated rearscreen control button.



Key:

1. Controls assembly without heated rearscreen
2. Controls assembly with heated rearscreen

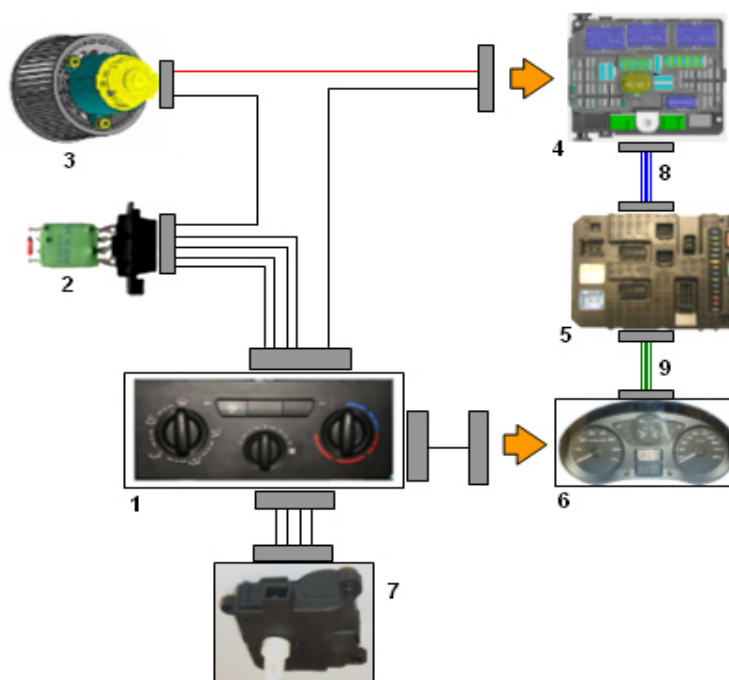
3. Air ventilation unit
4. Particle filter
5. Heater and distribution unit
6. WEBASTO additional heater



Heater operation (CH)

The controls related to distribution and mixing are accomplished with cables.

The air is made to enter by means of a motor (3), governed directly by the control assembly (1) and the resistance module (2) for the change in air speed.



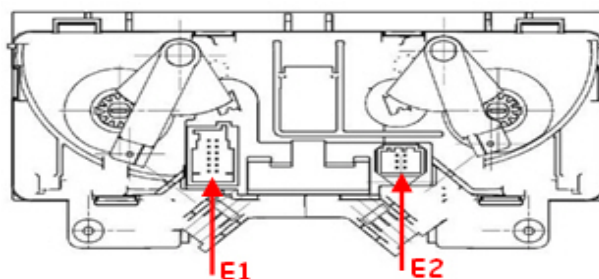
Key:

- 1. Controls assembly
- 2. Resistance module
- 3. Air ventilation motor
- 4. BSM

- 5. BSI
- 6. Instrument panel
- 7. Air recirculation motor
- 8. Can CAR network
- 9. Can CONF network

Controls assembly pin-out (CH)

The controls assembly interfaces with the vehicle's electric system by means of 2 connectors:
E1 with 12 pins - E2 with 6 pins



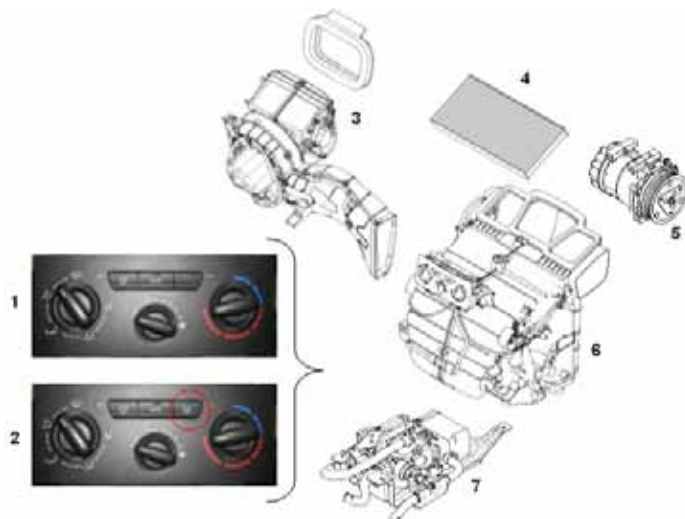
Connector (E1)				
Origin	Destination	Désignation	Pin	Description
Controls assembly (TDC)	BSI	Demande LUCH	1	Mise à la masse
BSI	Controls assembly (TDC)	Voyant LUCH	2	Mise au +12V
		+ Veilleuse	3	+ 12V piloté
		+ APC	4	+ 12V
Controls assembly (TDC)	Vehicle	Weights	5	0V
---	---	Info Tout Chaud	6	Mise à la masse
---	---	---	7	n.c.
---	---	---	8	n.c.
---	---	---	9	n.c.
---	---	---	10	n.c.
---	---	---	11	n.c.
---	---	---	12	n.c.

Connector (E2)				
Origin	Destination	Désignation	Pin	Description
Controls assembly (TDC)	Air recirculation motor	+ Alimentation	1	
		Air extérieur	2	
		Recyclage partiel	3	
		Recyclage total	4	
---	---	---	5	n.c.
---	---	---	6	n.c.



Manual climate control system (RF)

The manual climate control system comprises two types of different control assembly (1) due to whether there is the heated rearscreen control button.



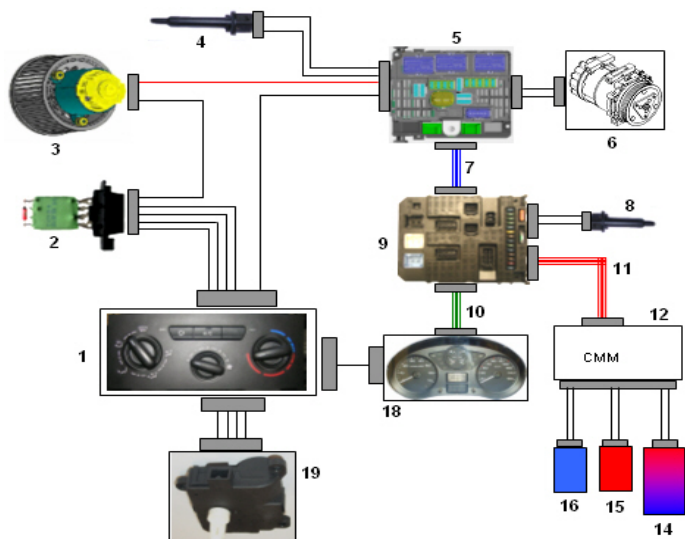
Key:

1. Controls assembly without heated rearscreen
2. Controls assembly with heated rearscreen
3. Air ventilation unit
4. Particle filter
5. Compressor
6. Heater and distribution unit
7. WEBASTO additional heater

Manual climate control operation (RF)

The controls related to distribution and mixing are accomplished with cables.

The air is made to enter by means of a main motor (3), governed directly by the control assembly (1) and the resistance module (2) for the change in air speed.



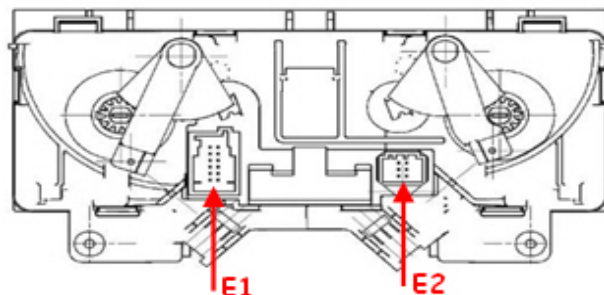
Key:

1. Controls assembly (TDC)
2. Resistance module
3. Air ventilation motor
4. Antifrost sensor
5. BSM
6. R134a gas compressor
7. Can network (CAR)
8. External air temperature sensor
9. BSI
10. Can network (CONF)
11. Can network (IS)
12. Engine control unit
14. Fan motor assembly (GMV)
15. R134a gas pressure sensor
16. Water temperature sensor
18. Instrument panel
19. Air recirculation motor



Controls assembly pin-out (RF)

The controls assembly interfaces with the vehicle's electric system by means of 2 connectors:
E1 with 12 pins - E2 with 6 pins



Connector (E1)				
Origin	Destination	Désignation	Pin	Description
Controls assembly (TDC)	BSI	Demande LUCH	1	Mise à la masse
BSI	Controls assembly (TDC)	Voyant LUCH	2	Mise au +12V
		+ Veilleuse	3	+ 12V piloté
		+ APC	4	+ 12V
Controls assembly (TDC)	Vehicle	Weights	5	0V
Controls assembly (TDC)	Instrument panel	Info Tout Chaud	6	Mise à la masse
Controls assembly (TDC)	BSI	Demande AC	7	Mise à la masse
---	---	---	8	n.c.
---	---	---	9	n.c.
---	---	---	10	n.c.
---	---	---	11	n.c.
---	---	---	12	n.c.

Connector (E2)				
Origin	Destination	Désignation	Pin	Description
Controls assembly (TDC)	Air recirculation motor	+ Alimentation	1	
		Air extérieur	2	
		Recyclage partiel	3	
		Recyclage total	4	
---	---	---	5	n.c.
---	---	---	6	n.c.

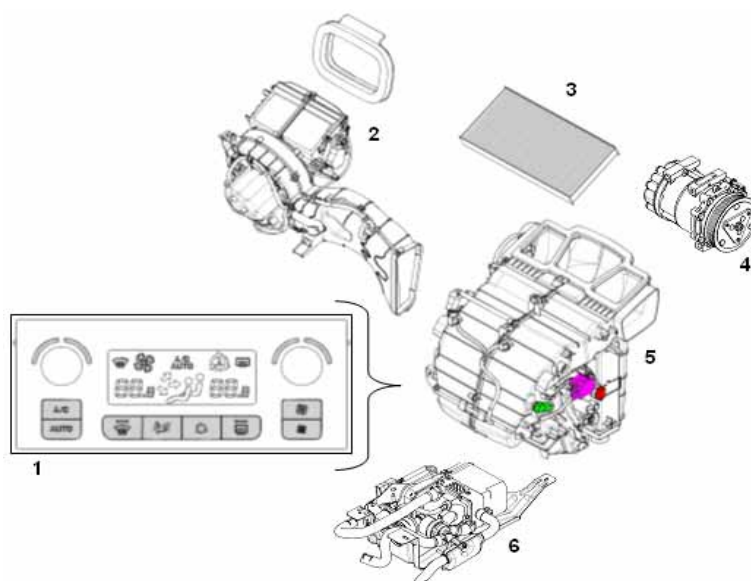


Two-zone automatic climate control system (RFTA)

The two-zone automatic climate control system comprises an electronic control assembly (1), from which it is possible to manage all the functions, and the following components:

- 1 Compressor
- 1 Evaporator temperature sensor
- 1 Left air temperature sensor
- 1 Right air temperature sensor
- 1 Air distribution motor
- 2 mixing motors

The heater and distribution unit is governed via electric motors by the controls assembly (1).



Key:

- 1. Controls assembly
- 2. Air ventilation unit
- 3. Particle filter

- 4. Compressor
- 5. Heater and distribution unit
- 6. WEBASTO additional heater

Two-zone automatic climate control operation (RFTA)

The front controls assembly (TDC CLIM AV) is connected to the Body Computer (NBC) by means of a CAN LS connection (125 Kbit/s), it ensures the following functions:

- CAN interface with NBC
- Acquisition of the set of buttons comprising the controls assembly (TDC)
- Acquisition of the different temperature sensors, ventilated air 1 and 2, evaporator, solar radiation),
- Management of controls assembly lighting (TDC) (rheostato, day/night),
- Management of the messages of the functions performed by TDC,
- Air ventilation motor control
- Control of motors for distribution, recirculation, mixing left and right,
- Diagnosis of the components connected to the controls assembly (TDC)
- Trouble and recovery management.

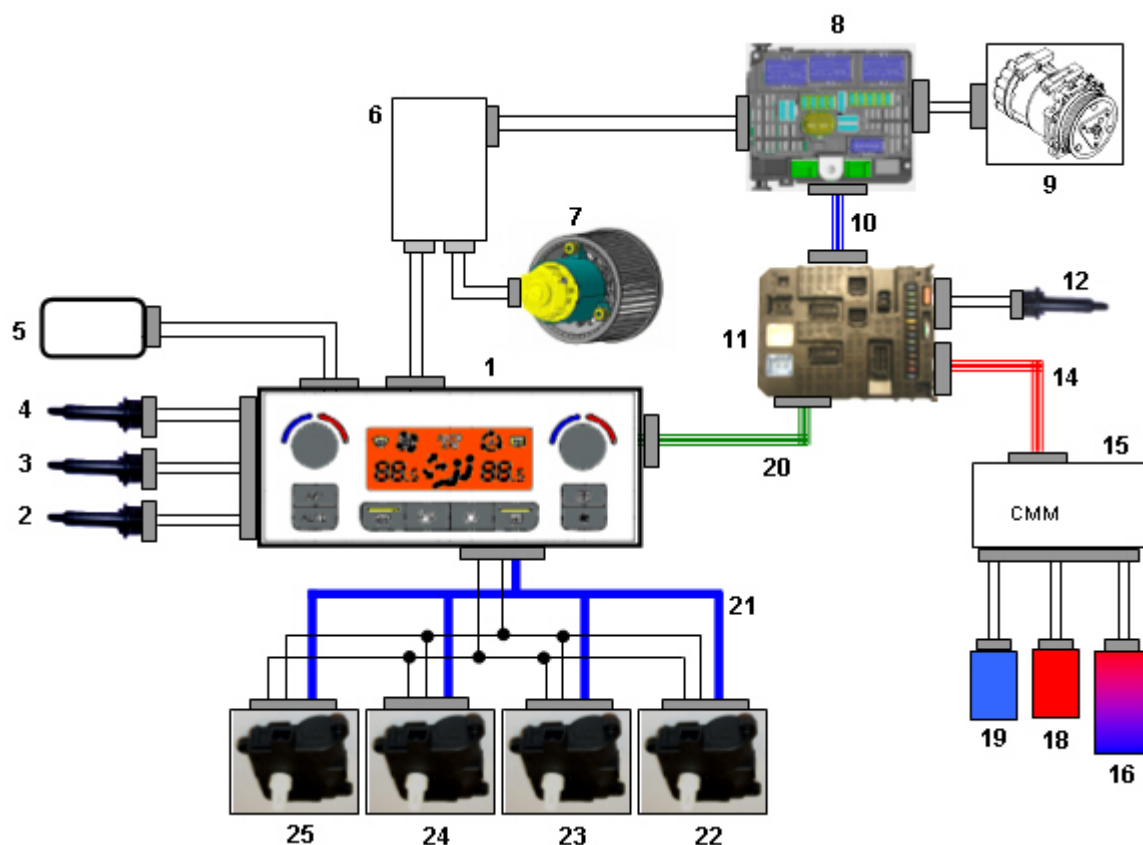


The NBC ensures:

- CAN interface with controls assembly (TDC),
- Management of climate control adjustment,
- Management and control of the heated rearscreen,
- Management of the compressor.

The BSM ensures:

- Management of the supply of the air ventilation motor,
- Control of the compressor.



Key:

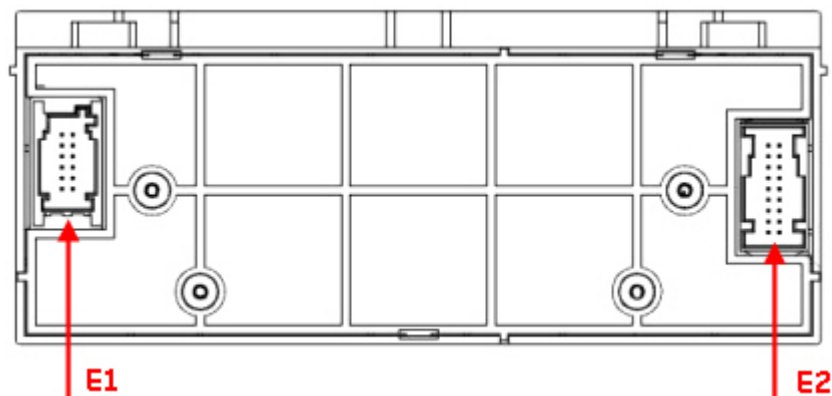
1. Controls assembly (TDC)
2. Antifrost sensor
3. Mixed air temperature sensor no. 1
4. Mixed air temperature sensor no. 2
5. Solar sensor
6. Air ventilation motor module
7. Air ventilation motor
9. R134a gas compressor
8. BSM
10. Can LS network (CAR)
11. BSI

12. External air temperature sensor
14. Can network (HS / IS)
15. Engine control unit
16. Fan motor assembly (GMV)
18. R134a gas pressure sensor
19. Water temperature sensor
20. Can LS network (CONF)
21. LIN network
22. Air distribution motor
23. Air recirculation motor
24. Driver air mixing motor
25. Passenger air mixing motor



Controls assembly pin-out (RFTA)

The controls assembly (TDC) interfaces with the vehicle's electric system by means of 2 connectors:
E1 with 12 pins - E2 with 18 pins.



Connector (E1)				
Origin	Destination	Désignation	Pin	Description
---	---	---	1	n.c.
---	---	---	2	n.c.
---	---	---	3	n.c.
---	---	---	4	n.c.
Vehicle	Controls assembly (TDC)	Ground	5	Electronic ground
---	---	---	6	n.c.
---	---	---	7	n.c.
		+ CAN	8	+ 12 Volt (max 3A)
BSI	Controls assembly (TDC)	CAN H	9	Can (CONF)
BSI	Controls assembly (TDC)	CAN L	10	Can (CONF)
---	---	---	11	n.c.
---	---	---	12	n.c.



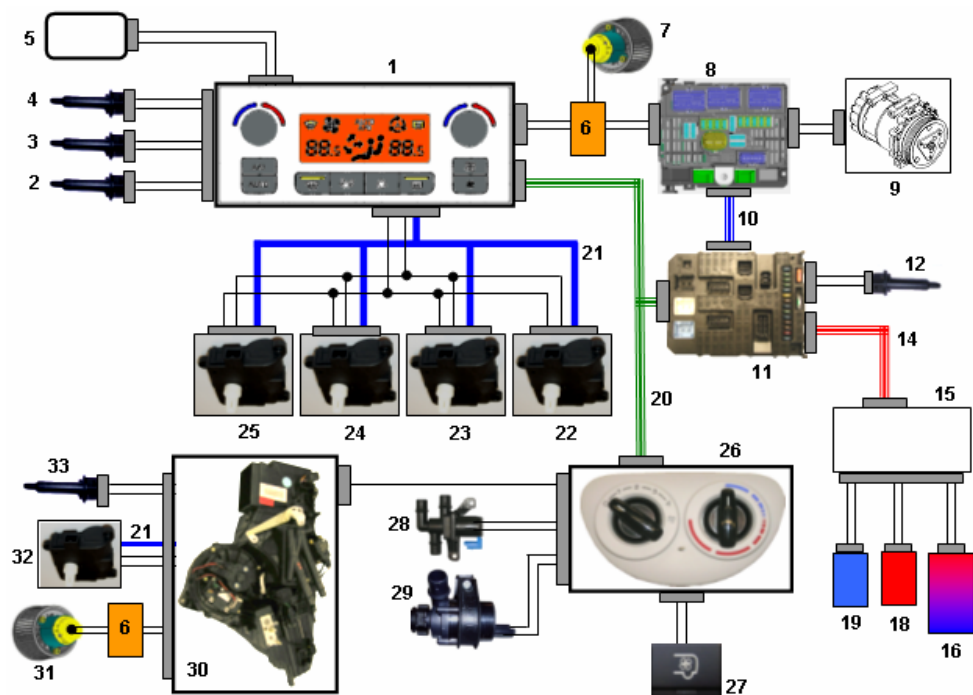
Connector (E2)				
Origin	Destination	Désignation	Pin	Description
Mixed air temp. sensor 1	Controls assembly (TDC)	Sensor power supply	1	+ 5 Volt
		ground	2	ground
Mixed air temp. sensor 2		Sensor power supply	3	+ 5 Volt
		ground	4	ground
Antifrost sensor		Sensor power supply	5	+ 5 Volt
		Signal	6	ground
Solar sensor		Power supply	7	
		Signal	8	ground
Controls assembly (TDC)	Air ventilation motor module	Motor command	9	Signal 0 -> 5 Volt
Air ventilation motor module	Controls assembly (TDC)	Feedback signal	10	Signal 0 -> 5 Volt
Controls assembly (TDC)	Stepper motors (*)	Power supply	11	+ 12 Volt (LIN)
		LIN Serial line	12	LIN network
		ground	13	Electronic ground
---	---		14	n.c.
---	---		15	n.c.
---	---		16	n.c.
---	---		17	n.c.
---	---		18	n.c.

(*) Motor: air distribution; air recirculation; driver air mixing; passenger air mixing.



Additional rear climate control system

The rear additional climate control system can be combined solely with the two-zone automatic climate control system (RFTA).



Key:

- | | |
|---|--|
| 1. Front controls assembly (TDC AV) | 18. R134a gas pressure sensor |
| 2. Antifrost sensor | 19. Water temperature sensor |
| 3. Mixed air temperature sensor no. 1 | 20. Can network (CONF) |
| 4. Mixed air temperature sensor no. 2 | 21. LIN network |
| 5. Solar sensor | 22. Air distribution motor |
| 6. Air ventilation motor control module | 23. Air recirculation motor |
| 7. Front air ventilation motor | 24. Driver air mixing motor |
| 8. BSM | 25. Passenger air mixing motor |
| 9. R134a gas compressor | 26. Rear controls assembly (TDC AR) |
| 10. Can network (CAR) | 27. Rear air-conditioning enabling button |
| 11. NBC (Body Computer) | 28. Hot water circuit solenoid valve (2-way) |
| 12. External air temperature sensor | 29. Additional water pump |
| 14. Can network (HS / IS) | 30. Rear climate control unit |
| 15. Engine control unit | 31. Rear air ventilation motor |
| 16. Fan motor assembly (GMV) | 32. Distribution / mixing motor |
| | 33. Rear anti-frost sensor |

The NBC node manages the following functions:

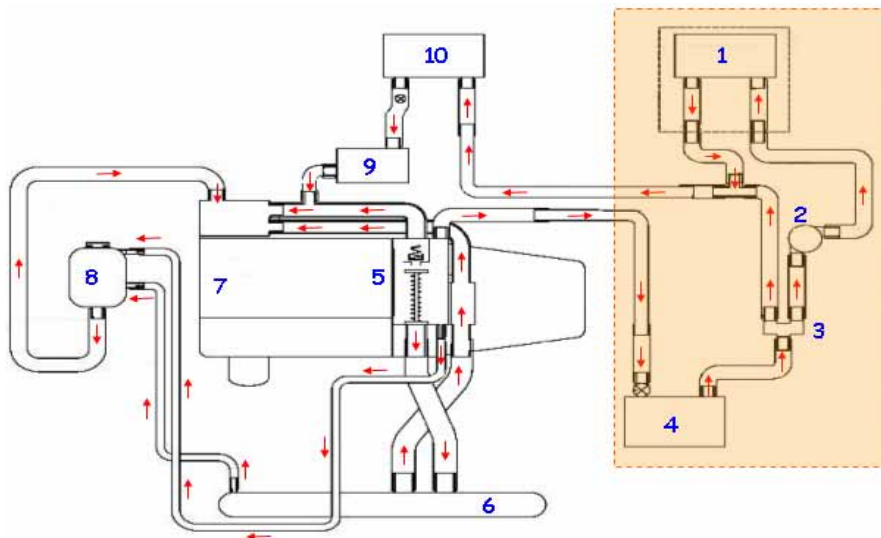
- CAN network interface with Front controls assembly
- CAN network interface with Rear controls assembly
- Management of climate control adjustment.
- Compressor control management

The BSM node manages the following functions:

- The power supply of the front air ventilation motor.
- The power supply of the rear air ventilation motor.
- Control of the compressor.



Supplementary hot water heating circuit



Key:

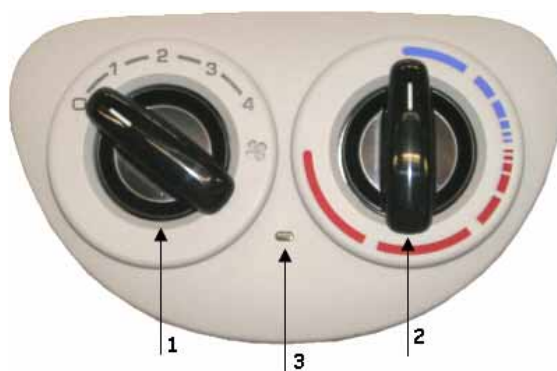
- 1. Additional rear climate control heater
- 2. Additional water pump
- 3. Solenoid valve (2-way)
- 4. Webasto
- 5. Engine thermostat

- 6. Engine coolant radiator
- 7. Engine
- 8. Expansion tank
- 9. EGR
- 10. Main front climate control heater

Rear air-conditioning controls cluster

The figure shows the controls panel on the roof that has:

- mixing and distribution control knob (2).
- fan speed control knob (1).
- rear climate control indicator light (3).



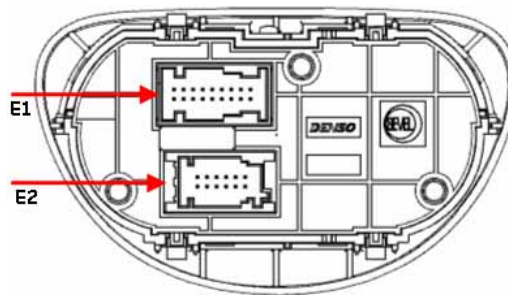
The supplementary unit's mixing and distribution are regulated by an electric actuator (stepper motor) controlled via a LIN serial line.



With the control knob (2) it is possible to move both the mixing flap and the distribution flap at the same time according to the following strategies:

1. By setting knob (2) on full heat the air flow distribution will use only the vents on the rear right side panel.
2. By setting knob (2) on full cold the air flow distribution will use only the vents on the roof.
3. By setting knob (2) on the middle position the air flow distribution will take place simultaneously from both the vents on the roof and the vents on the rear right side panel.

Rear climate control unit pin out



Connector (E1)				
Origin	Destination	Description	Pin	Description
Antifrost sensor	Rear controls assembly	Sensor power supply	1	(+) Positive
			2	(-) Ground
Water circuit solenoid valve (3-way)	Rear controls assembly	Solenoid valve power supply	3	(+) Positive
			4	(-) Ground
Front controls assembly	Air motor control module	Command signal	5	0 – 5 Volt
Air motor control module	Front controls assembly	Command check signal	6	0 – 5 Volt
Rear controls assembly	Rear unit stepper motor	Power supply	7	(+) Positive
		LIN BUS	8	
		Power supply	9	(-) Electronic ground
---	---	---	10	n.c.
---	---	---	11	n.c.
---	---	---	12	n.c.
---	---	---	13	n.c.
---	---	---	14	n.c.
---	---	---	15	n.c.
---	---	---	16	n.c.
---	---	---	17	n.c.
---	---	---	18	n.c.



Connector (E2)				
Origin	Destination	Description	Pin	Description
Vehicle	Rear controls assembly	CAN power supply	1	(+) Positive
Rear controls assembly	On-Off switch	On-Off switch LED command	2	
Vehicle	Rear controls assembly	CAN H	3	
			4	(-) Ground
On-Off switch		On-Off switch status	5	
Vehicle	Rear controls assembly	CAN L	6	
Rear controls assembly	Water circuit relay	Additional water pump command	7	
		Water circuit solenoid valve command (3-way)	8	
---	---	---	9	n.c.
---	---	---	10	n.c.
---	---	---	11	n.c.
---	---	---	12	n.c.

Rear air-conditioning enabling button

The rear climate control enabling button is on the front instrument panel.



Key : 1. rear climate control on 2. rear climate control off

The status (on/off) of the rear climate control enabling button is acquired with the key on drive (+ APC) and engine off. In this condition the rear climate control unit does not govern the following components:

- Rear air ventilation motor
- Mixing/distribution motor
- Gas circuit solenoid valve
- Hot water circuit solenoid valve
- Additional water pump

The rear climate control can only be turned on with the key on drive (+ APC) and engine running. In this condition if the enabling button is ON (1) the indicator light on the button and the one on the rear controls assembly will light up at the same time.



Operation with enabling button ON

The rear controls assembly governs as requested by the NBC:

- Gas circuit solenoid valve.
- Hot water circuit solenoid valve.
- Additional water pump.
- Mixing/distribution motor depending on the position of the right-hand rotary knob of the rear controls assembly.

The rear controls assembly (TDC AR) sends the NBC node the following information:

- Mixing hatch position (0 to 100%).
- Air flow speed (position from 0 to 4).
- Air temperature at the evaporator outlet.

Rear climate control unit

The rear climate control unit is located behind the rear right panel.

The unit is composed of an evaporator and heater to permit mixing the flow of air, a ventilation motor governed by an electronic module controlled by the rear controls assembly, expansion valve, antifrost sensor and a stepper motor to regulate the temperature and distribution of the air flow at the same time.



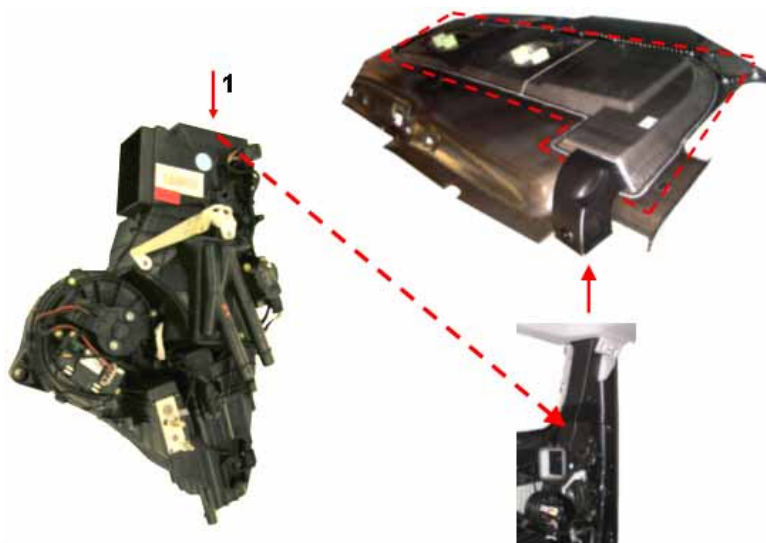
Key:

- | | |
|--|-------------------------------------|
| 1. Air ventilation motor module | 5. Antifrost sensor |
| 2. Air ventilation motor | 6. R134a gas pipe couplings |
| 3. Stepper motor for air distribution/mixing | 7. Evaporator |
| 4. Water pipe couplings | 8. Vehicle wiring connection |
| | 9. Air ventilation motor connection |

Upper rear ventilation



The following figure shows the air circuit relating to the upper ventilation, made with a vertical duct and a duct incorporated in the roof covering panel.

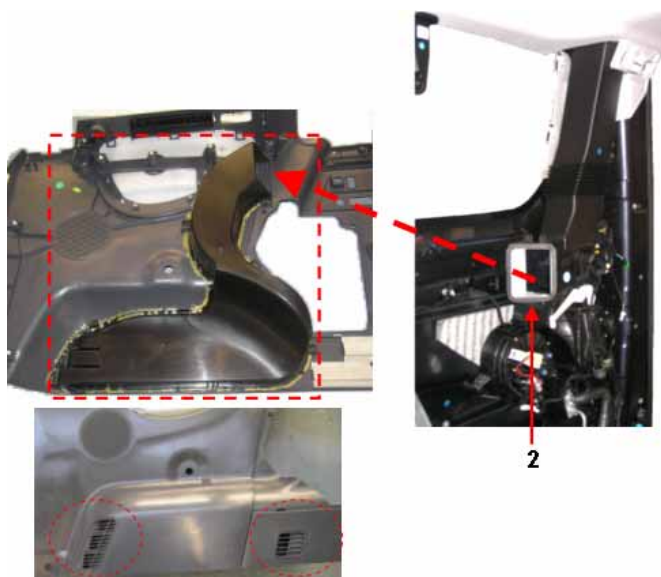


Key:

1 . Upper air flow vent

Lower rear ventilation

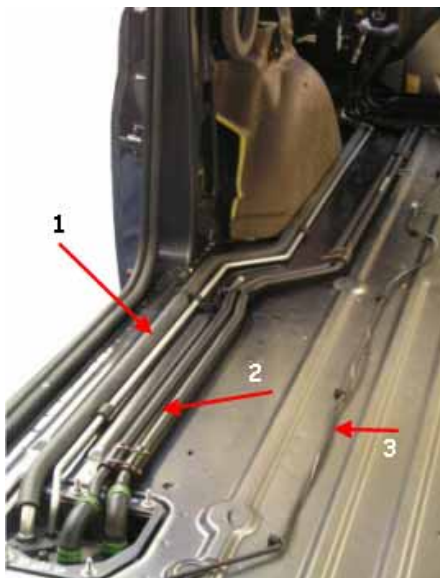
The following figure shows the air circuit relating to the lower ventilation (2), made with a duct incorporated in the rear right panel.



Passenger compartment water and gas pipe passage

On the right of the passenger compartment (see figure below) there are the pipes of the refrigerant gas circuit and heating circuit of the additional rear climate control unit.

The above-mentioned pipes, depending on the vehicle version (short or long wheelbase), can have different lengths.



Key:

- 1. Refrigeration circuit pipes (R134a gas)
- 2. Water heating circuit pipes
- 3. Rear additional climate control unit supply cables

Hot water circuit solenoid valve

The supplementary solenoid valve in the vehicle's heating circuit has the job of activating a supplementary branch of the circuit related to the rear climate control unit.



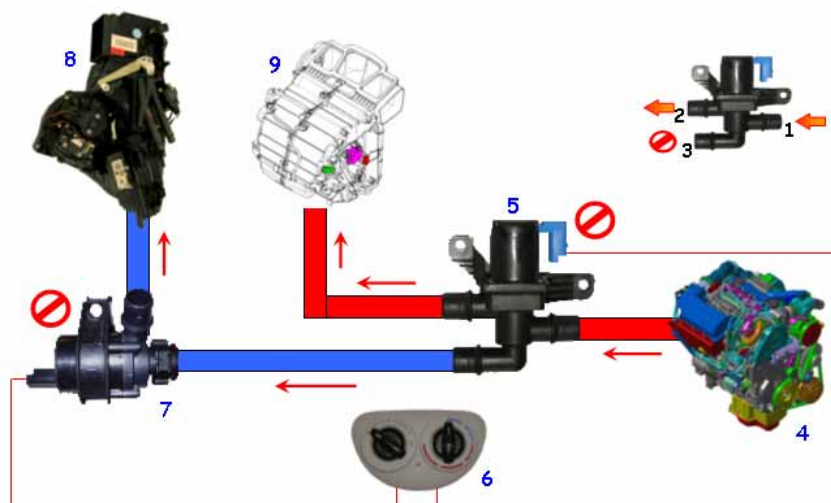
Key:

- 1. Hot water inlet from the engine thermostat or from the Webasto when applicable
- 2. Water outlet towards main front heater
- 3. Water outlet towards additional rear heater



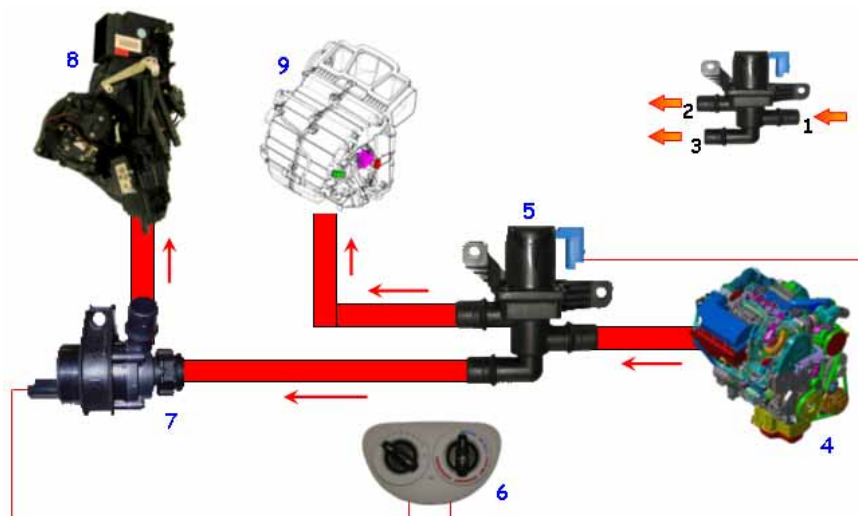
Additional heating circuit operation with solenoid valve OFF

With the solenoid valve OFF, the additional water heating circuit is off.



Additional heating circuit operation with solenoid valve ON

With the solenoid valve ON, the additional water heating circuit works in parallel with the main front one.



Key:

1. Hot water inlet from the engine thermostat or from the Webasto when applicable
2. Water outlet towards main front heater
3. Water outlet towards additional rear heater

4. Engine
5. Solenoid valve (2-way)
6. Rear controls assembly
7. Additional water pump
8. Rear climate control unit
9. Front climate control unit



Additional water pump

The additional water pump can improve the flow of water when the rear climate control unit is working. In operation the water pump assures a charge of coolant to the rear climate control unit of approximately 900 litres/h. at a relative pressure of 2.5 bar.



Key:

- 1. Hot water inlet from the 2-way solenoid valve
- 2. Water outlet towards additional rear heater
- 3. Electric connector

Component location (2-way solenoid valve; water pump)

The solenoid valve and water pump are fitted under the body of the vehicle on the left-hand side.



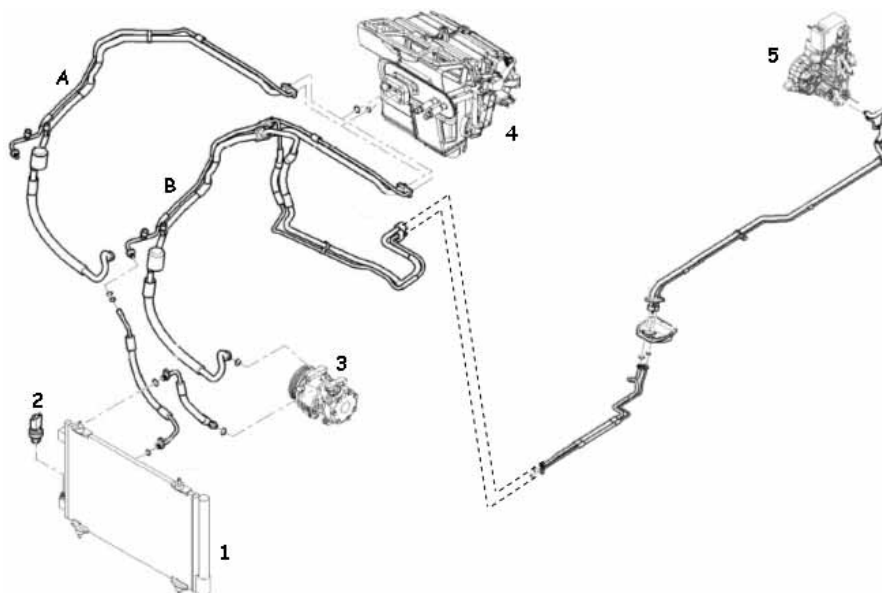
Key:

- 1. 2-way solenoid valve
- 2. Water pump

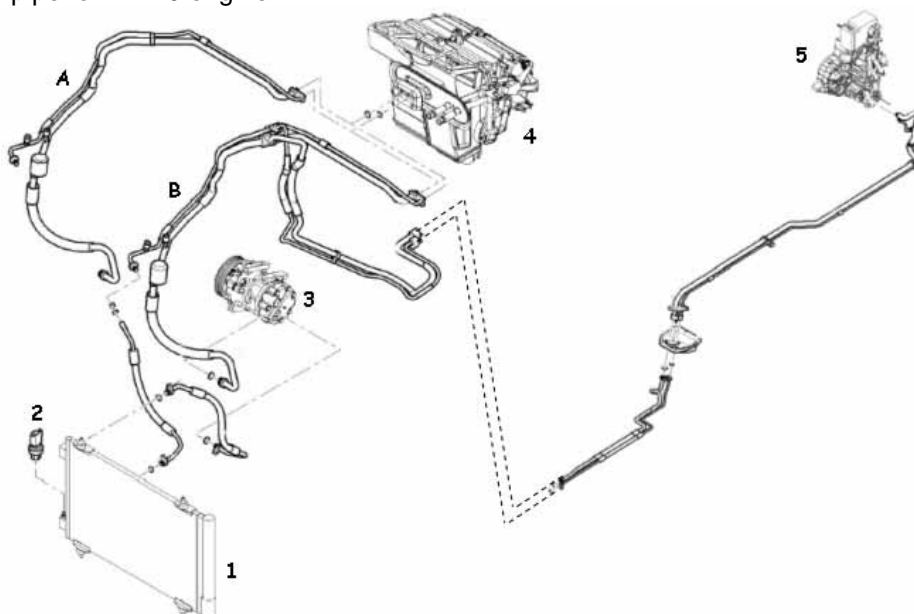


Pipes

Specific GAS pipe for DV6 engine



Specific GAS pipe for DW10 engine



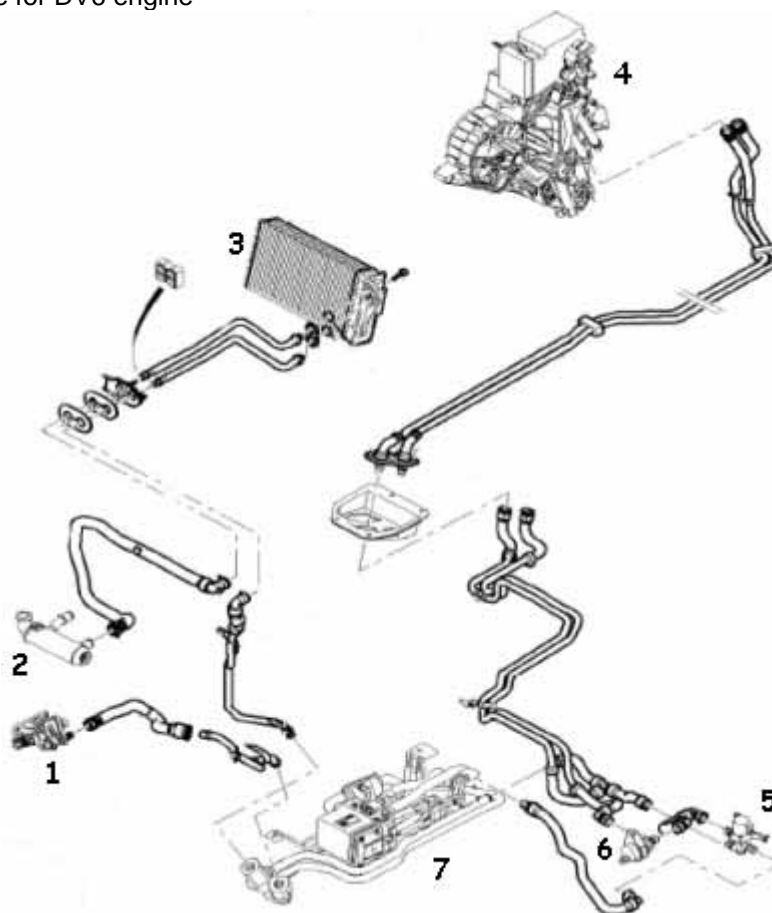
Single gas pipe key:

- 1. Condenser
- 2. R 134a gas pressure sensor
- 3. Compressor
- 4. Front climate control unit
- 5. Rear climate control unit
- A. Pipes for version without rear climate control unit



B. Pipes for version with rear climate control unit

Specific Water pipe for DV6 engine

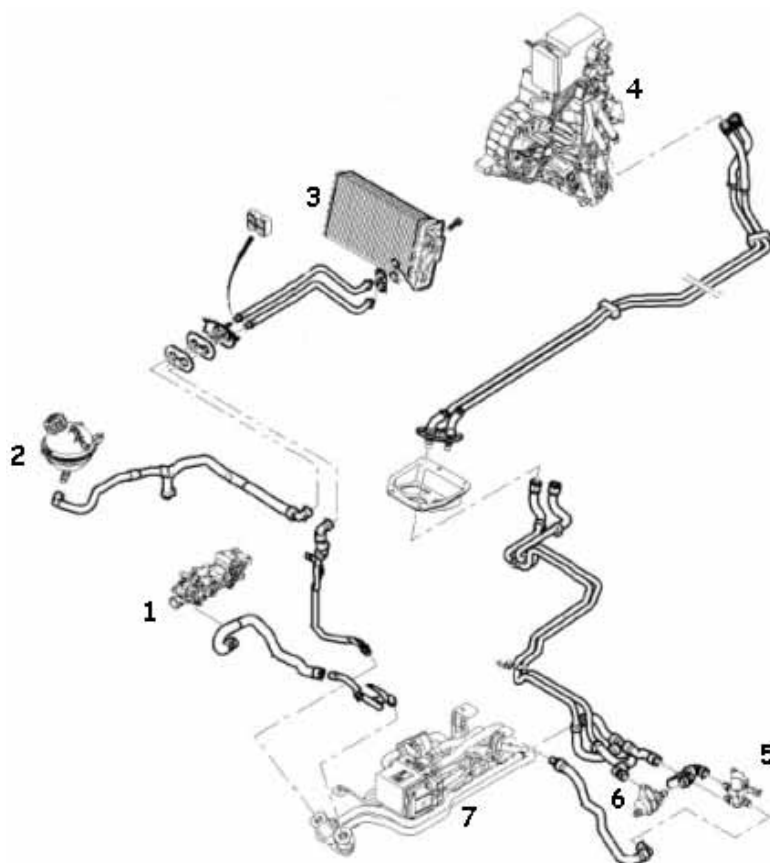


Key:

- 1. Thermostatic valve of the DV6 engine
- 2. EGR
- 3. Front climate control radiator
- 4. Rear climate control unit
- 5. 2-way solenoid valve
- 6. Additional electric water pump
- 7. Webasto unit



Specific Water pipe for DW10 engine



Key:

1. Thermostatic valve of the DW10 engine
2. Expansion tank
3. Front climate control radiator
4. Rear climate control unit
5. 2-way solenoid valve
6. Additional electric water pump
7. Webasto unit

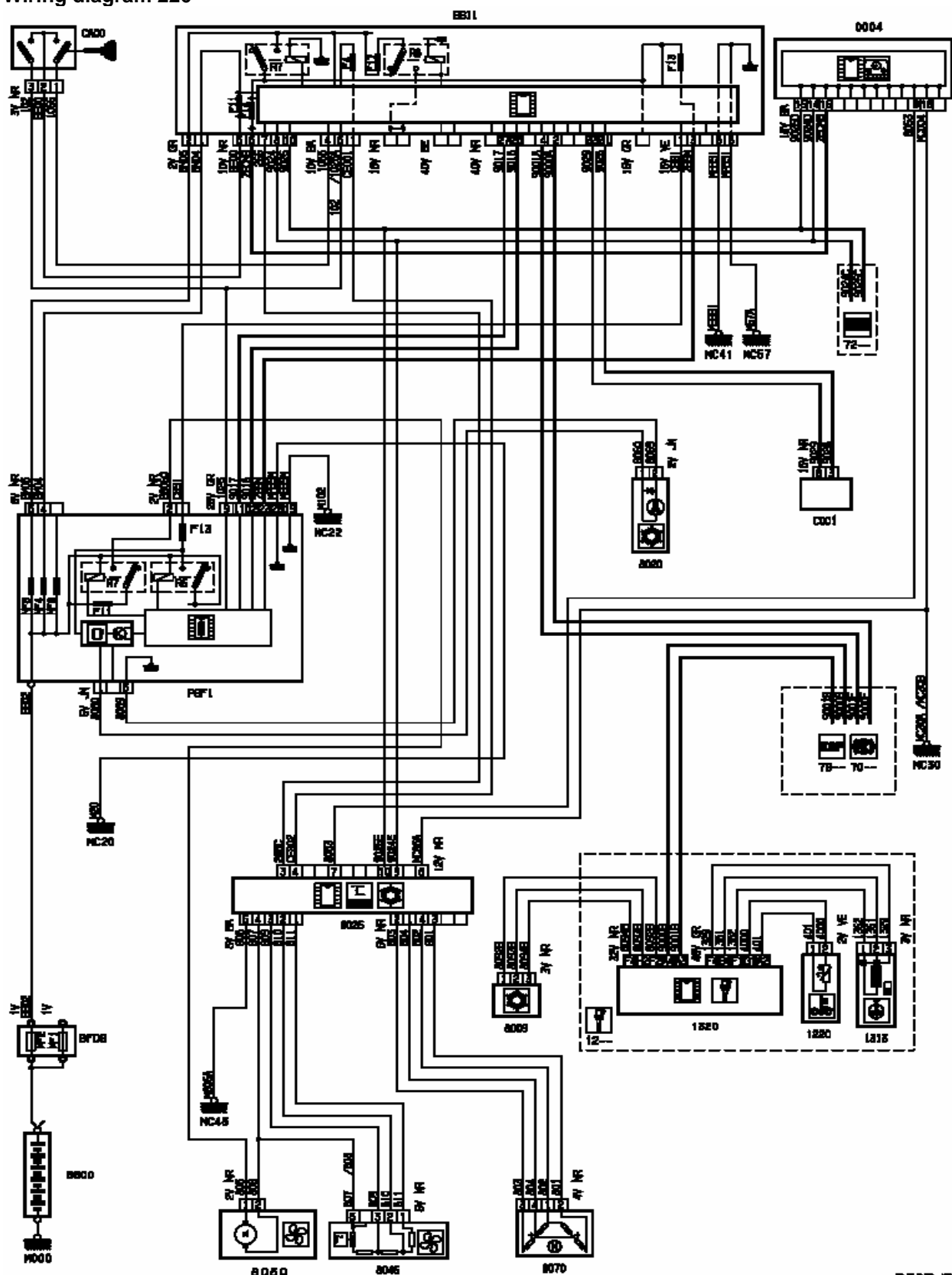
Wiring diagrams

The diagrams shown are the following:

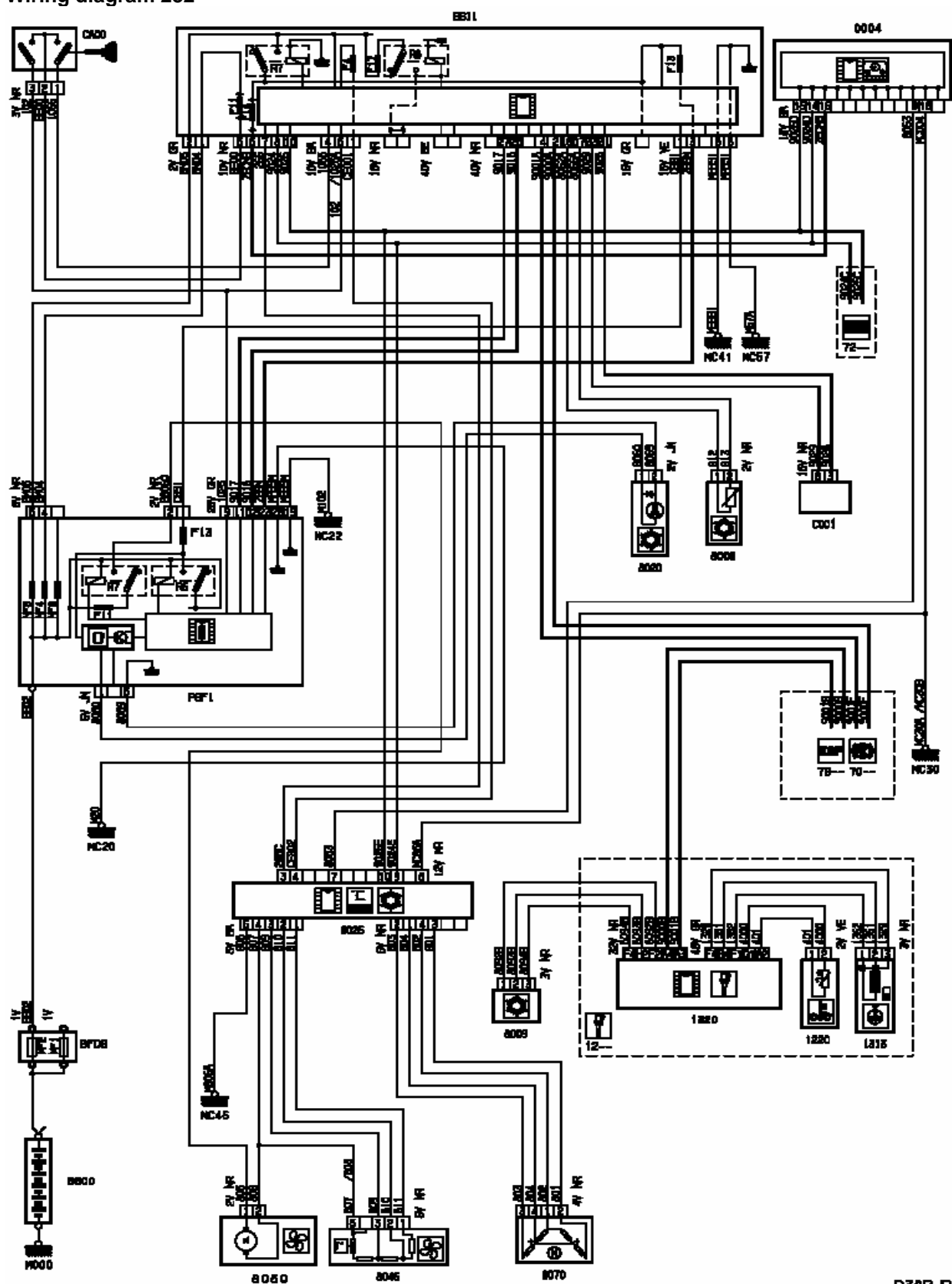
- Wiring diagram 226: Heater
- Wiring diagram 232: Manual climate control
- Wiring diagram 238: Automatic climate control
- Wiring diagram 241: Additional rear climate control

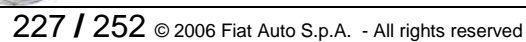


Wiring diagram 226

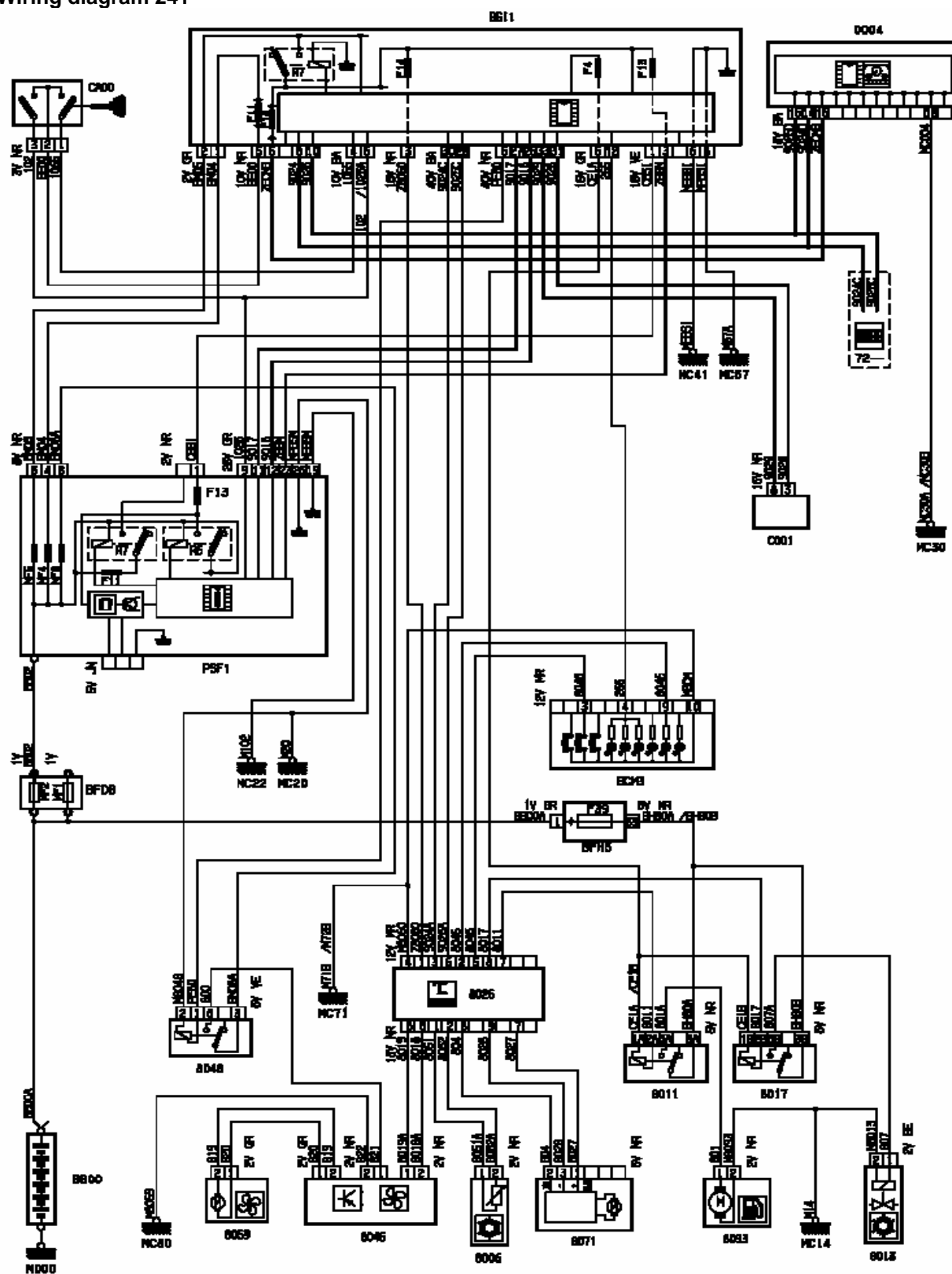


Wiring diagram 232





Wiring diagram 241



Wiring diagrams key

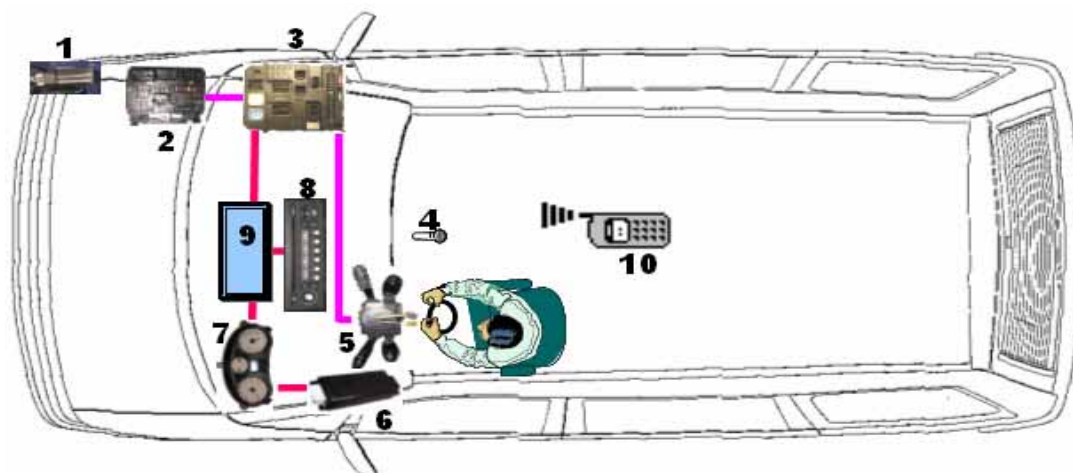
0004 : ?
1320 : Engine control unit
1220 : CAPTEUR TEMPERATURE EAU MOTEUR
1313 : CAPTEUR REGIME MOTEUR
8006 : THERMISTANCE EVAPORATEUR (SI SEPARÉ)
8009 : CAPTEUR DE PRESSION DE FLUIDE FRIGORIFIQUE
8011 : RELAIS DE COMMANDE POMPE A EAU BOUCLE
8013 : ELECTROVANNE CLIMATISATION - EV CLIM ADDIT
8017 : RELAIS DE COMMANDE ELECTROVANNE
8020 : COMPRESSEUR REFRIGERATION
8024 : THERMISTANCE D'AIR HABITACLE GAUCHE
8025 : FACADE CLIMATISEUR (SI SEPARÉ)
8026 : FACADE CLIMATISATION ADDITIONNELLE
8028 : THERMISTANCE D'AIR HABITACLE DROITE
8033 : THERMISTANCE D'ENSOLEILLEMENT
8045 : MODULE COMMANDE PULSEUR(SI SEPARÉ)
8046 : RESISTANCE VITESSE PULSEUR (SI SEPARÉ)
8048 : Relè MODULE COMMANDE PULSEUR(SI SEPARÉ)
8050 : MOTEUR PULSEUR (SI SEPARÉ)
8059 : MOTEUR PULSEUR CLIMATISATION ADDITIONNELLE
8063 : MOTOREDUCTEUR VOLET DE MIXAGE DROIT
8064 : MOTOREDUCTEUR VOLET DE MIXAGE GAUCHE
8070 : MOTOREDUCTEUR VOLET ENTREE AIR
8071 : MOTOREDUCTEUR VOLET DE DISTRIBUTION
8093 : POMPE A CARBURANT CHAUFFAGE ADD ADDITIONNEL
BCM3 : BLOC COMMUTATEUR MULTIFONCTIONS GAUCHE
BSI : Body Computer (NBC)
BB00 : BATTERY
BFDB : Max fuses on the battery positive cable
CA00 : Ignition block
C001 : CONNECTEUR DIAGNOSTIC
PSF1 : PLATINE DE SERVITUDE-BOITE FUSIBLES
BFH5 : fuse F39



8.7 "Bluetooth" hands-free system (KML : Kit Mains Libres)

The Hands-Free System (KML), thanks to the Bluetooth communication protocol, enables connecting a mobile phone, at a maximum distance of 10 metres, with the vehicle's radio system.

This speakerphone system allows the user to be able to concentrate on driving and have his hands on the steering wheel, subsequently improving the level of safety.



Key:

- 1. Condenser
- 2. Engine junction unit (BSM)
- 3. Intelligent services control unit (BSI)
- 4. Microphone

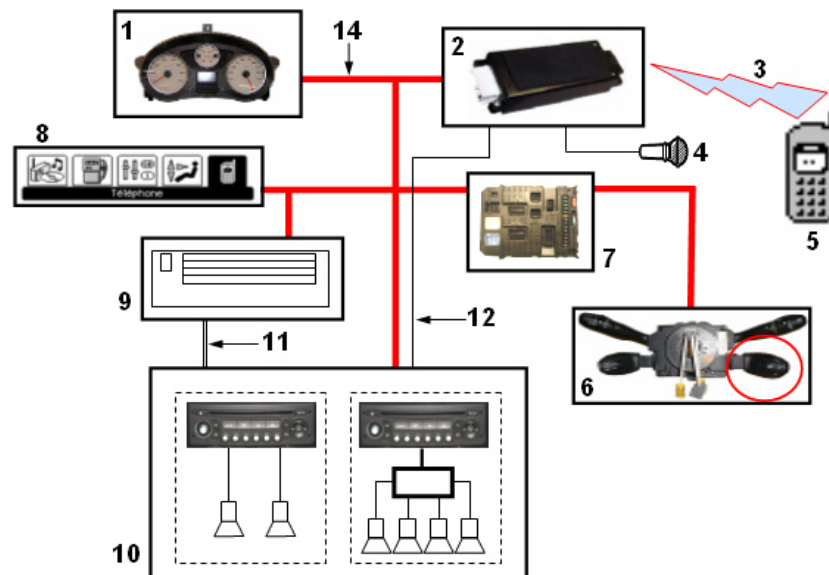
- 5. Stalk unit (Comm 2005)
- 6. KML control unit
- 7. Instrument panel
- 8. Car radio
- 9. Multifunction screen (VMF)
- 10. Mobile phone

The Hands-Free System (KML), connected to the "CAN LS CONF" network, in order to function needs to integrate with the vehicle's radio system composed of the following elements:

- Multifunction screen (type C),
- Audio system composed of a radio:
 - RD4 with a multifunction screen (VMF) type (C -).
- Audio amplifier (optional),
- Controls on the steering wheel with specific function buttons,
- Integrated microphone
- Compact disc loader (optional).



Functional diagram:



Key:

- | | |
|--|---|
| 1. Instrument panel | 8. Multifunction screen (VMF) |
| 2. KML control unit | 9. CD-Changer |
| 3. Bluetooth signal | 10. Car radio |
| 4. Microphone | 11. Electric connection |
| 5. Mobile phone | 12. Audio signal output from KML control unit |
| 6. Stalk unit (Comm 2005) | 14. Can LS Confort network (125 Kb/s) |
| 7. Intelligent services control unit (BSI) | |

List of compatible mobile phones

- NOKIA 6310(i)
- NOKIA 8910(i)
- NOKIA 3650
- NOKIA 6600
- NOKIA 6650 (07/2003 UMTS)
- ERICSSON T68i
- ERICSSON T68i
- ERICSSON P800
- ERICSSON T610
- SIEMENS S55
- SIEMENS S56 (version US)
- PHILIPS 820
- PHILIPS 825



KML control unit location

The Hands-Free Kit control unit (KML) is behind the covering under the steering wheel on the left-hand side.



Functional system checks

The different functional checks of the Hands-Free system (KML) can be summarised as in the following list:

- phone present or not (bluetooth connection)
- GSM mobile phone signal level and transmit the correct information to display to the multifunction screen (VMF). The conversion is for the KML (see *GSM / Battery level graph display chapter*).
- communication status
- read the different phone logs, max 30 numbers:
 - last 10 calls made
 - last 10 calls received,
 - last 10 unanswered calls
- read the content of the:
 - SIM card address book
 - Phone book
 - SIM card + Phone address book



Warning: When there are phone numbers saved in both the SIM card and phone memory, there will be a request to delete the double that is done to the advantage of the number in the phone memory.

- incoming SMS on the phone
- mobile phone battery status and transmit the correct information to display to the multifunction screen (VMF). The conversion is for the KML (see *GSM / Battery level graph display chapter*).
- operator's name
- network roaming
- incoming message on the phone's answering service. This information is retransmitted over the CAN network.
- call resend present or missing. This information must be retransmitted over the CAN network.
- Last name of the mobile phone connected. This information must be retransmitted over the CAN network.

Note: Certain functions depend on the mobile phone used.

Human-Machine Interface (IHM)

This user interface (IHM - Interface Homme-Machine) gives all the information normally contained on the display of the mobile phone:



General functional information

Call management

Call emission is authorised under the following conditions:

- The KML is authorised to forward calls only when the KML is on.

Ringtone management

If the KML cannot trace the phone ringtone it must generate one of its own.



Incoming calls

When a call arrives, the KML signals the incoming call to the radio and the screen.

A popup window appears on the screen stating that a call can be taken. The phone ringtone is retransmitted to the vehicle's speakers. The user can then decide whether to take or reject the call with the aid of the remote control under the steering wheel or with voice commands uttered by the driver. From the moment the call is accepted, the KML transmits the set of information of the communication to the multifunction screen (VMF).

Outgoing calls

- An outgoing call can be emitted from the log (outgoing, received, unanswered calls). The information, name and number will be transmitted to the multifunction screen (VMF).
- An outgoing call can be emitted from the phone keypad. The information, name and number will be transmitted to the multifunction screen (VMF).
- An anonymous call from the call log does not permit making an outgoing call.

Double call

The KML can manage double calls:

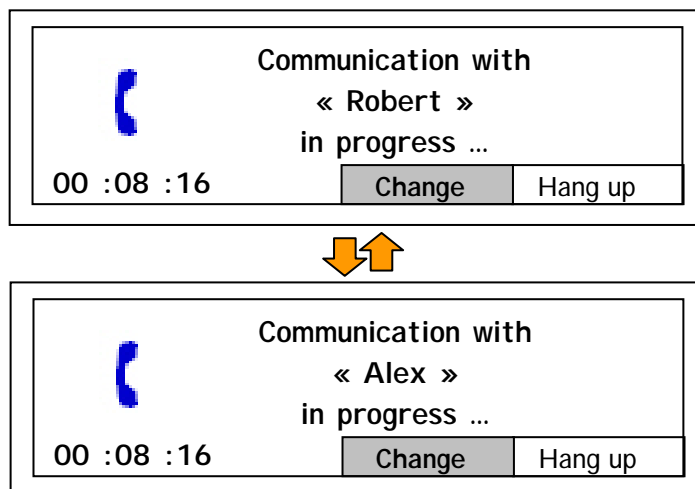
- Swapping over (between two calls)
- Outgoing calls dialled on the phone
- Incoming calls

This management can be done either from the phone or from the controls assembly under the steering wheel (CSV).

Swapping over permits passing from call 1 to call 2 and vice versa.

It can be done either with the mobile phone or with the KML, in both cases the KML will signal the call changes with messages displayed on the multifunction screen (VMF).

With no user selection, when the time managed by the multifunction screen (VMF) elapses, this window will be closed without any other action.

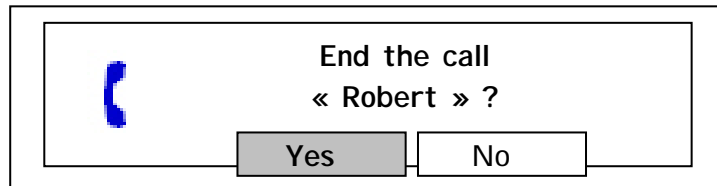


If the user hangs up on one call the system will automatically pass onto the waiting call.

Note: In "double call" mode the KML system manages two communication time meters relating to call 1 and call 2.



When the user is already on a call and there is an incoming call, the KML warns the user with a visual popup message and a beep.



If the selected option is "**Yes**", then the communication will pass on to the last incoming call and the first call will be put on hold.

If the selected option is "**No**", when the screen-managed popup time elapses, the call will be ended and the communication in progress will continue.

Presentation of the number

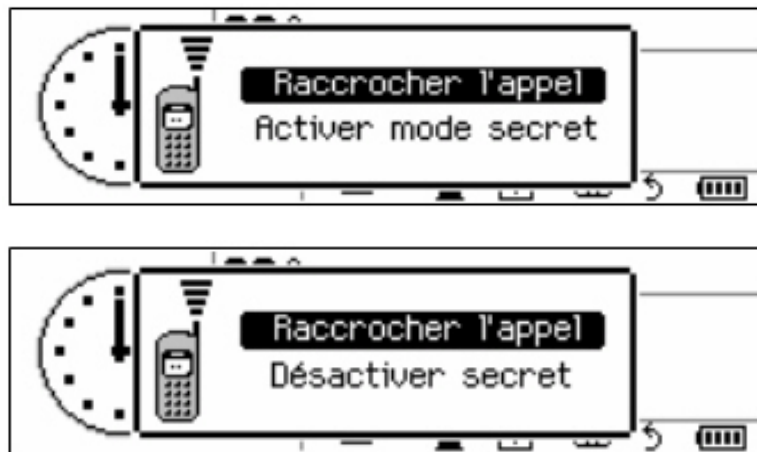
The KML recognises the caller's name and / or number. This is valid for double and single calls. When the KML does not recognise the caller because he or she is not in the log, it only displays the number of the incoming call. If the name and number of the caller are not communicated by the network the system will display "private number".

Confidential communication mode (microphone mute)

The confidential mode function (MUTE) enables cutting off the communication between the KML user and the other person. This is done by turning off or reactivating the microphone.

The confidential mode is possible only in communication.

In order to turn the mode (MUTE) on/off the user must access the menu via the controls assembly under the steering wheel (CSV).



Language management

The languages supported by the KML are the following:

- French
- English
- German
- Spanish
- Italian
- Dutch
- Portuguese



List management

The KML system must manage several lists, the log list, received, outgoing and missed calls list, service calls list and the lists concerning twinned phones (connected via bluetooth).

List management is divided into 3 parts:

- opening
- navigation
- closing

The three phases are ensured by buttons on the following devices:

- Radio (RRT)
- Controls assembly under the steering wheel (CSV)

Opening the menu lists or validating an item is ensured by the “OK” button

- Button on the front of the radio (RRT)
- Controls assembly button under the steering wheel (CSV)

Line to line navigation [Up (▲) e Giù (▼)] :

- Buttons on the front of the radio (RRT)
- Controls assembly buttons under the steering wheel (CSV)

Page to page navigation [search Up (◀◀) e ricerca Giù (▶▶)] :

- Buttons on the front of the radio (RRT)

Closing the menu lists is ensured by the “ESC” button or due to “Time out” (30 seconds).

- Button on the front of the radio (RRT)



Buttons on the front panel of the radio used by the KML



Button	Context	Type of support	Control
OK	Lists	AS	Menu activation or Selection validation
ESC	---	AC	Cancel
		AL	Exit menu. Return to the screen of the current application
▲	Lists	AS	Top line shift
		AM	Top line repetitive shift
▼	Lists	AS	Bottom line shift
		AM	Bottom line repetitive shift
◀◀	Liste	AS	Spostamento riga superiore in tutti gli elenchi KML ad eccezione del repertorio misto.
			Spostamento lettera/lettera (A ®Z) nel repertorio misto
		AM	Spostamento ripetitivo riga superiore in tutti gli elenchi KML ad eccezione del repertorio misto.
▶▶	Liste	AS	Spostamento riga inferiore in tutti gli elenchi KML ad eccezione del repertorio misto
			Spostamento lettera/lettera (Z ® A) nel repertorio misto.
		AM	Spostamento ripetitivo riga inferiore in tutti gli elenchi KML ad eccezione del repertorio misto.



Control buttons under the steering wheel (CSV)



Button	Context	Type of support	Control
OK	Lists	AS	Menu activation or Selection validation
▲	Lists	AS	Top line shift
		AM	Top line repetitive shift
▼	Lists	AS	Bottom line shift
		AM	Bottom line repetitive shift
◀◀	Liste	AS	Spostamento riga superiore in tutti gli elenchi KML ad eccezione del repertorio misto.
			Spostamento lettera/lettera (A ®Z) nel repertorio misto
		AM	Spostamento ripetitivo riga superiore in tutti gli elenchi KML ad eccezione del repertorio misto.
▶▶	Liste	AS	Spostamento riga inferiore in tutti gli elenchi KML ad eccezione del repertorio misto.
			Spostamento lettera/lettera (Z ® A) nel repertorio misto.
		AM	Spostamento ripetitivo riga inferiore in tutti gli elenchi KML ad eccezione del repertorio misto.

Key (type of support)

AS: Single press (right from starting to press on the button)

AC: Short press (if pressed and held for longer than 2 seconds)

AL: Long press (if pressed and held for longer than 2 seconds)

AM: Press and hold



SMS text messages

The KML must manage the SMS messages and warn the user of a received text message.

When the phone's SMS memory is full, the KML informs the user of the phone's status when a new SMS text message arrives.

Reading text messages on the multifunction screen (VMF) is prohibited with the vehicle in motion.

The operations of reading, writing and deleting SMS text messages on the SIM card must be done by using the phone's keypad and display.

Message on the phone's answering service

Reading text messages on the multifunction screen (VMF) is prohibited with the vehicle in motion.

The operations of reading, writing and deleting SMS text messages on the SIM card must be done by using the phone's keypad and display.

Service Call

The KML manages 3 different services that are in order:

1. Customer Centre
2. Mechanical Assistance
3. Emergency Assistance

If one or more services are not available, the order is changed so as to register the first service available.

Example: "Repair Service" not available, the order becomes:

- 1 Customer Centre
- 2 Emergency

Customer Centre Call

The number of the Customer Centre is a specific number for the user providing a response to functional problems with the vehicle.

Remarks:

- This number is not displayed on the multifunction screen (VMF).
- This number is specific and depends on the make of the vehicle.
- Double calls are possible when this number is dialled.

Mechanical Assistance Call

The Repair number is a specific number for the user for requesting assistance in the event of trouble with the vehicle.

Remarks:

- This number is not displayed on the multifunction screen (VMF).
- This number is specific and depends on the make of the vehicle.
- Double calls are possible when this number is dialled.

Emergency Assistance Call

The KML manages emergency calls , (112 for Italy). This number is displayed on the multifunction screen (VMF) at the start of the call.

Remarks:

- Only the user can forward an emergency call manually.
- No double calls are possible when this number is dialled.
- The emergency call (112) can be forwarded even without an SIM card.



Voice Recognition

Turning the "Voice Recognition" function on and off is only possible by starting a manual action on the button on the:

- Controls assembly under the steering wheel (CSV)

Turning the "Voice Recognition" function on and off is signalled by an audible signal of 3 distinct notes followed by an audible announcement, voice synthesis by the KML.

During a session of voice recognition there is a "Time-out" of 5 seconds within which the user must utter the message. After this time the session will be ended.

If the voice message uttered by the user is not recognised the KML system informs the user with the following announcement: Repeat, please!

Voice commands

The following table lists the user voice commands:

Terms / symbols function	Voice command
Delete the last digit	Change
Forward a call	Call
#	Hash
+	Plus
*	Asterisk
0	Zero
1	One
2	Two
3	Three
4	Four
5	Five
6	Six
7	Seven
8	Eight
9	Nine

The following table lists the voice commands emitted by the KML system:

Voice announcements emitted by the system
Number dialling abandoned
Last Digit(s) Deleted
Call in progress
Say the number
Number deleted. Restart dialling the number from the start
Repeat, please!
To use voice dialling, utter one or more digits in succession. To change the last digits, say "change". To start the call, say
No digit to delete.
No number recorded. Call impossible



Service continuity

If the user is on a phone conversation and in the meantime gets into the vehicle and an authorised bluetooth connection is made, the KML system will allow the conversation to continue with the vehicle's audio system.

On the contrary, if the user is on a phone conversation in the vehicle and interrupts the Bluetooth connection, the conversation will continue on the mobile phone.

The observation holds whether the user is in the vehicle or outside the Bluetooth communication area.

Warning: A bluetooth connection can be interrupted by the user either on purpose or by going outside the limit of the area of coverage (10 metres).

Connection of a Bluetooth phone

For the KML system to connect to a mobile phone via a bluetooth connection, some conditions must be met:

- KML On
- No mobile phone connected.
- No twinning in connection.

Electronic diagnosis

Reading parameters

The diagnosis tool enables reading the following parameters:

- Identification number
- Functional reference number
- Supplier's code
- Complementary number (parent company supplier reference number)
- Software release (software release according to supplier's coding)
- Calibration version (according to supplier's need)
- KML internal diagnosis version
- Parameters and defects code (DTC)
- Type of application
- (for needs of manufacture or warranty)
- Serial number (for needs of manufacture or warranty)
- Date of manufacture (for needs of manufacture or warranty)

Configurations of the (KML)

The KML system can be configured with the diagnosis instrumentation for the following parameters only:

- Definition of the different service numbers
- Name of the Hands-Free Kit (KML)
- Definitions of the microphone gain, presence of an anti-echo, anti-interference filter
- Voice commands

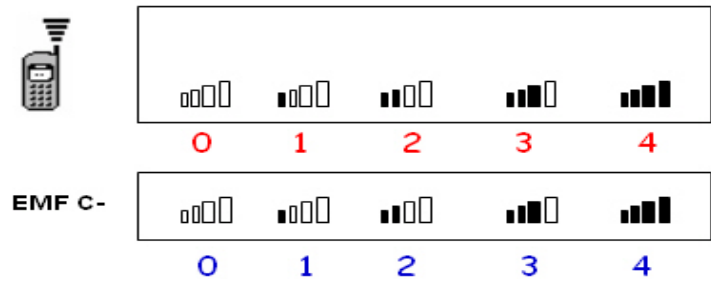
Graphic display of the GSM / Battery level



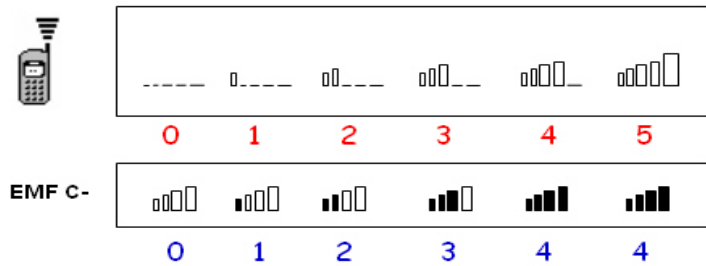
There are many versions of mobile phone on the market and each one of them could have a different graphic scale of the GSM / Battery signal level.

To this regard, the rules for conversion between the GSM mobile phone level bars and the value displayed on the multifunction screen (EMF C -) are given here:

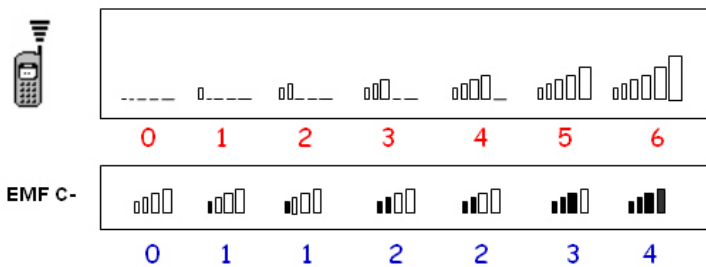
A, Case of a phone with 4 level bars



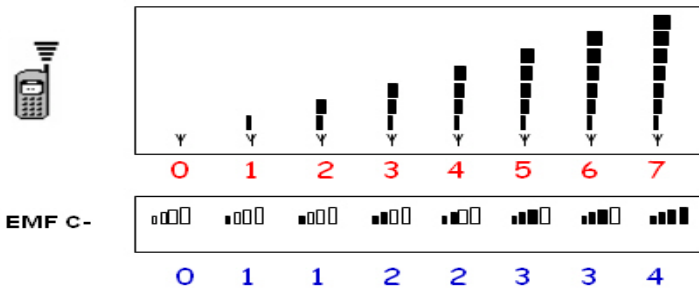
B, Case of a phone with 5 level bars



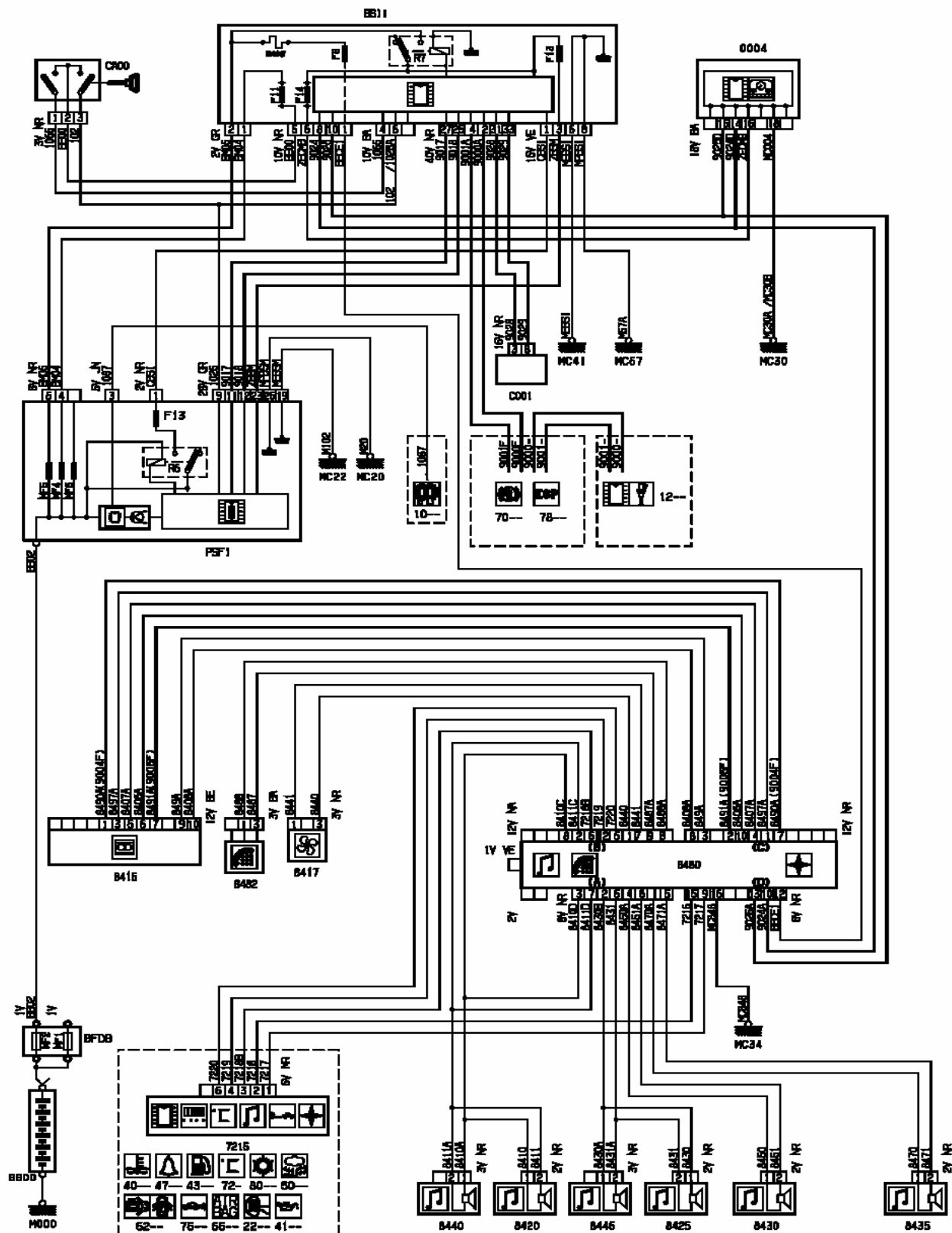
C, Case of a phone with 6 level bars



D, Case of a phone with 7 level bars



Wiring diagram 274



Wiring diagram key

7215 : Multifunction screen
8415 : CD loader
8417 : Radio-receiver fan
8420 : Front LH door speaker
8425 : Front RH door speaker
8430 : Rear LH door speaker
8435 : Rear RH door speaker
8440 : Front LH Tweeter speaker
8445 Front RH Tweeter speaker
8480 : Telematics transceiver
8482 : Radio Phone microphone
BSI : Body Computer (NBC)
BB00 : BATTERY
BFDB : Max fusibili sul cavo positivo batteria
CA00 : Blocchetto avviamento
C001 : DIAGNOSIS CONNECTOR
PSF1 : SERVICES FUSE BOX PLATE
0004 : Quadro strumenti



8.8 ALARM

General

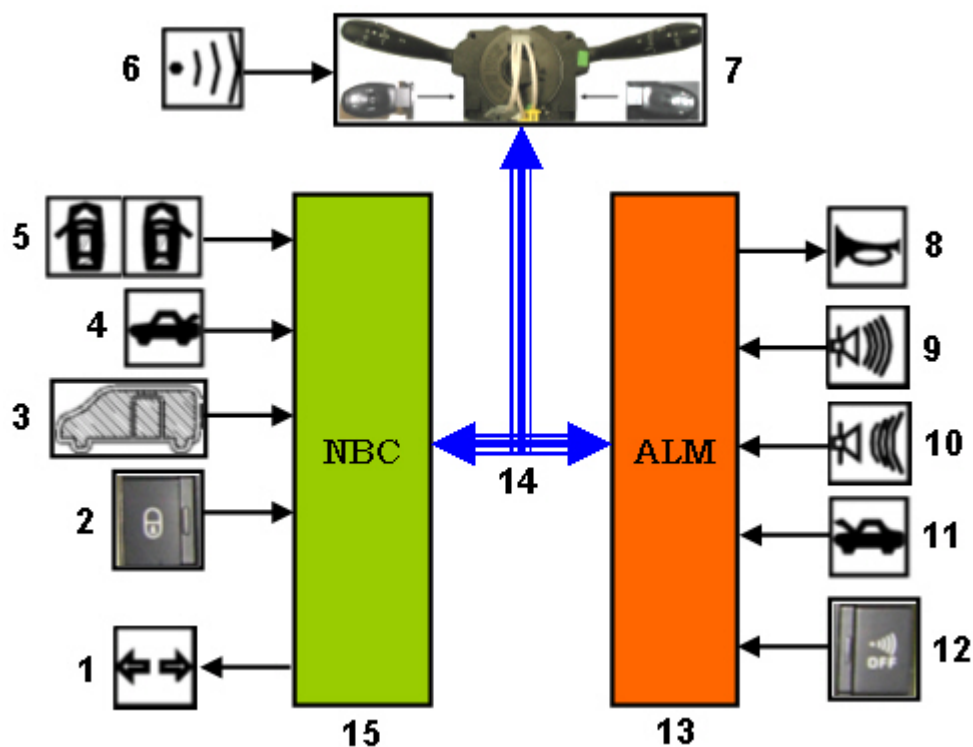
The car is equipped with an electronic alarm that can only be activated with a remote control, with perimeter (external) and volumetric (internal) protection.

The alarm is the ultrasound type and has the job of managing:

- volumetric detection,
- power supply and management of the ultrasound sensors,
- perimeter detection,
- siren.

Functional diagram

The following figure illustrates the connections between the various elements.



Key:

1. Blinker
2. Central locking button
3. Side sliding door switches
4. Rear door switch
5. Front door switches (driver and passenger)
6. Remote control antenna
7. Stalk unit

8. Siren
9. Ultrasound sensor (TX)
10. Ultrasound sensor (RX)
11. Bonnet switch
12. Volumetric sensor off button
13. Alarm control unit
14. Can LS CAR network (125 K/bit)
- 15 . Body Computer



Operation

Volumetric surveillance is ensured by two ultrasound sensors, located in the front courtesy light, that enable detecting a movement or a change in volume.

The perimeter control is managed:

- by the Body Computer as regards the signals from the contacts on the front doors, side doors and rear hatch.
- by the Alarm node as regards the signal from the switch on the bonnet release mechanism.

In case of break-in:

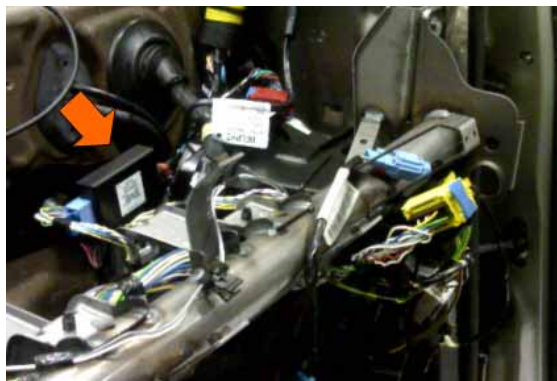
- the Body Computer turns on the left and right direction indicators for the visual signals,
- the Alarm node turns on the audible warning (siren) and the alarm LED.

The system status is indicated by a LED on the dashboard with the following modes:

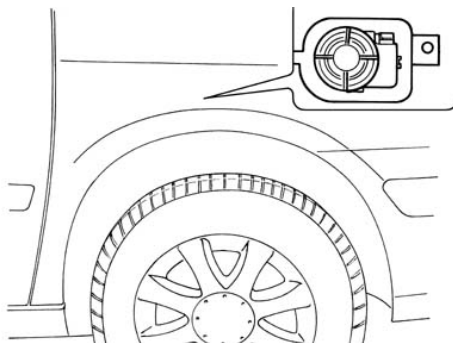
- blinking LED (frequency 1HZ): alarm on,
- LED with fast blinking (frequency 5HZ): saving an attempted break-in,
- LED off: alarm off,
- LED on (steady light): alarm on with inhibition of the volumetric surveillance function.

Position of components

- The Alarm Node: is located behind the passenger glove compartment, to the side of the Body Computer.



- The siren: is secured on the related support between the mudguard and the shoulder of the front right mudguard.



- The volumetric surveillance off button: is located on the left-hand side of the dashboard for left-hand drive vehicles and on the right-hand side for right-hand drive vehicles.

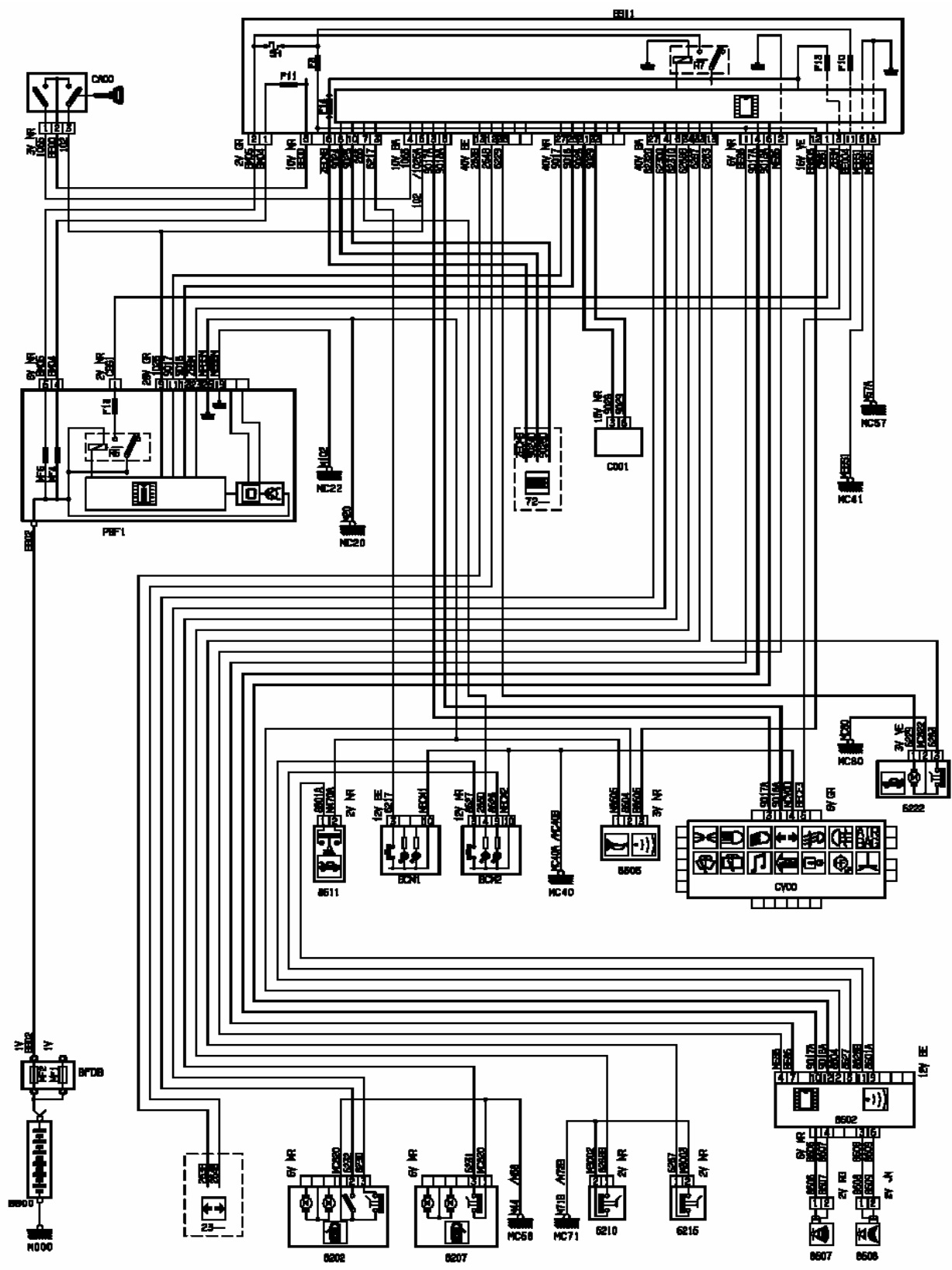


- The volumetric sensors: are located in the front middle courtesy light.



Wiring diagram





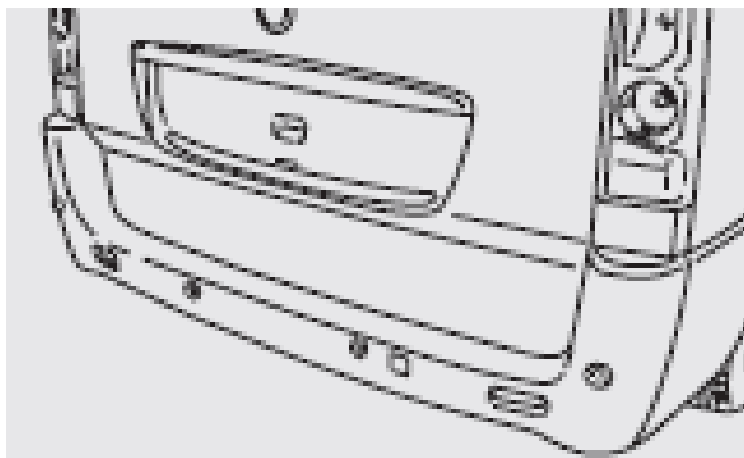
Wiring diagram key

6202 : Driver's door lock
6207 : Passenger door lock
6210 : Left sliding side door lock switch
6215 : Right sliding side door lock switch
6222 : Rear hatch lock
8602 : Alarm control unit
8607 : Ultrasound sensor - emitter
8608 : Ultrasound sensor - receiver
8605 : Alarm siren
8611 : Bonnet lock switch
BCM2 : Volumetric off switch (right panel)
BCM1 : Central locking switch (left panel)
BSI : Body Computer (NBC)
BB00 : Battery
BFDB : Max fuses on the battery positive cable
CA00 : Ignition block
C001 : Diagnosis connector
PSF1 : SERVICES FUSE BOX PLATE



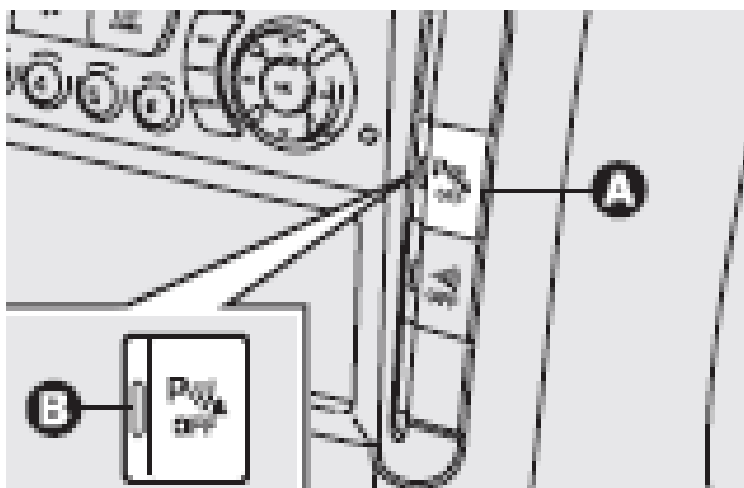
8.9 PARKING SENSORS

Installed in the vehicle's rear bumper, their function is to detect obstacles near the back of the vehicle with an intermittent audible warning.
The frequency of the acoustic signal increases as the vehicle gets nearer the obstacle.



Turning off Sensors

Momentary turning off, press button A on the right-hand side of the middle instrument panel. Indicator light B on the button lights up when turned off.

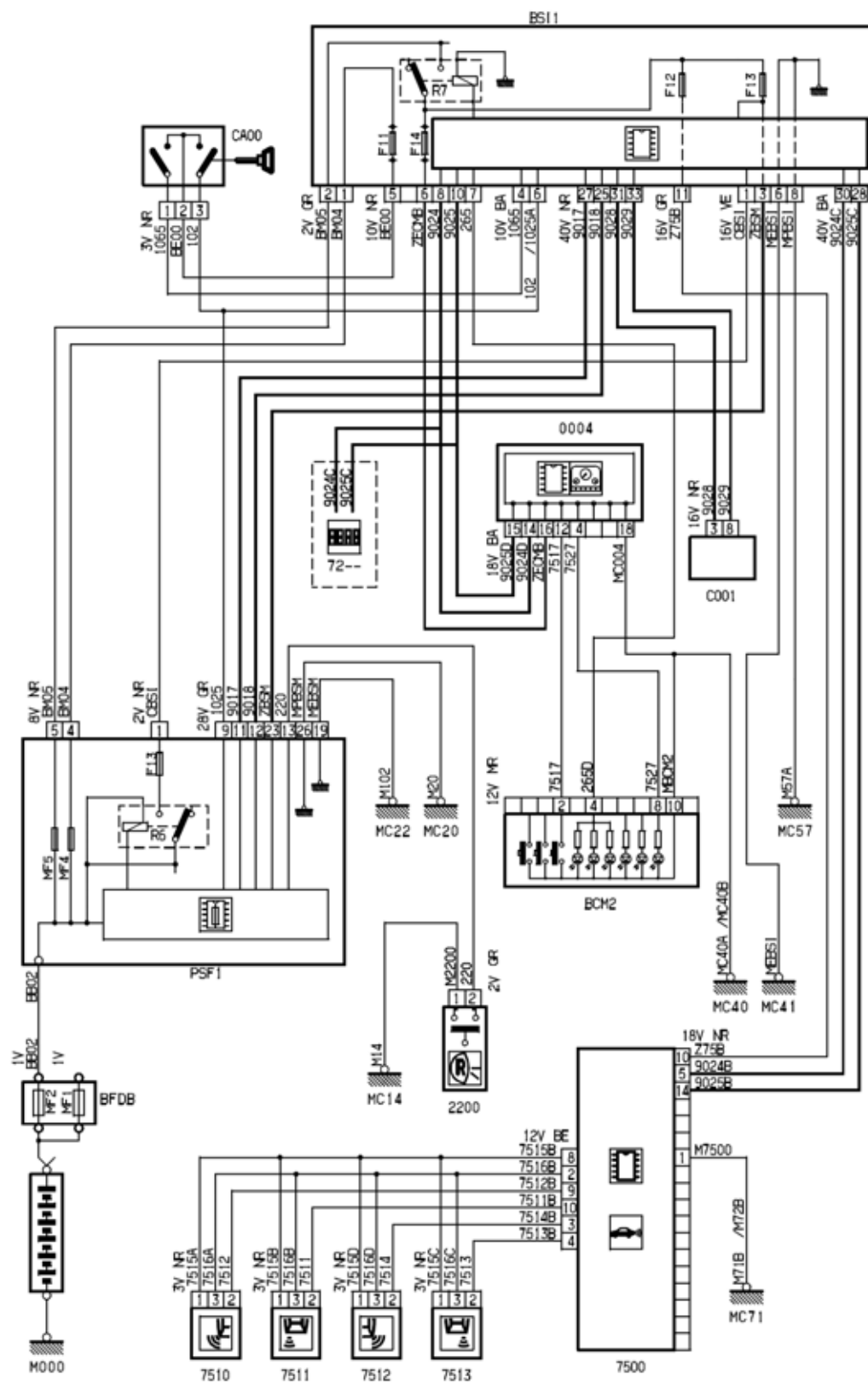


Trouble

This is signalled by engaging reverse gear with an audible warning and simultaneous lighting of indicator light B, accompanied by a message on the display.



Wiring diagram



Wiring diagram key

7500 : Parking sensor control unit
7510 : Parking sensor
7511 : Parking sensor
7512 : Parking sensor
7513 : Parking sensor
2200 : Reverse gear switch
BCM2 : Volumetric off switch (right panel)
BSI : Body Computer (NBC)
BFDB : Max fuses on the battery positive cable
CA00 : Ignition block
0004 : Instrument panel
C001 : Diagnosis connector
PSF1 : SERVICES FUSE BOX PLATE

